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The Control of Narcotic Drugs and the Concept of International Administration

BY PROF. JOSEPH P. CHAMBERLAIN

I. The Framework

The narcotics control organization, as it now exists, is the result of experience over many years.

It began, before the creation of the League of Nations, with the Treaty of 1912, which laid the foundations, and laid them on a sound basis, but which set up no administrative agency and which depended solely on the goodwill of governments for its administration. When the League of Nations came into being, the carrying out of the treaty was entrusted to it, and an administrative agency, the Opium Advisory Committee, was promptly set up to advise the Council and Assembly of the League as to the steps to be taken to make the Treaty effective. Subsequently, aided by the impetus of the League toward better international organization and administration and greatly helped by the League machinery for drafting conventions, the control developed through the Treaties of 1925, of 1931 and of 1936 to the strong position it held at the end of the League period. The Convention of 1925 extended and strengthened the League background and set up the Permanent Central Opium Board to watch the international trade in narcotics, and gave it the means of enforcement through its power as a judicial body. In the Convention of 1931, the Supervisory Body was created to make more effective the important function of control of estimates of needs in different countries, one of the bases of international narcotics control. Then, in the Treaty of 1936, infractions of narcotic laws were made criminal laws of a world interest.

In the composition of the three organs of the narcotics control—the OAC, the Board and the Supervisory Body—their functions were taken into consideration. The OAC had important administrative functions, but it was also policy making in connexion with the Council and Assembly, so that, upon it, governments were appointed which sent their representatives to its meetings. The representatives spoke not only as members of an international body but also with the authority of their governments. The Board and the Supervisory Body, as administrative organs, were composed of individuals. The Board was appointed by the Council of the League of Nations. Its members were independent and their independence was guarded by the requirement that they should not be in direct dependence on any government. Their functions were administrative and judicial and stress was laid on their independence in the international conference that formulated the Treaty of 1925. The Supervisory Body, exercising the important function of making the estimates of use of drugs which the governments agreed to observe, was even further removed, by the method of its appointment, from any control by governments. It was a unique international organization in that its members were appointed by different international agencies, no one of which controlled a majority, to make sure that there should be no political influence brought to bear upon it.

The United Nations took over from the League, and the governments signatory to the treaties, by the Protocol of 1946, vested, in the appropriate agencies of the United Nations, the powers held by the League agencies. The Council no longer existed; the Economic and Social Council was given its powers and duties; the General Assembly took over powers and duties from the Assembly. The Opium Advisory Committee became the Narcotics Commission, appointed by the Economic and Social Council, and other modifications in form were made to correspond with the new situation.

II. Procedure

The narcotics organization is proof of the close interdependence of nations and the need of their association for the accomplishment of an object of importance to each one of them separately, and therefore to all of them as a group. It is because no one country could protect itself against the evils of addiction that they found it necessary to associate themselves in limiting the spread

of a habit which all regarded as an evil. There was thus the strong motive of a national interest which moved the governments and which has held them together in the fight against one of the great curses of the human race. The fact that it is recognized as an evil has made easier the work of the control and has made very effective the weapon of publicity, which, as the Opium Advisory Committee has said, is one of its chief weapons. But publicity alone would not have been sufficient to bring about the success of the work. The co-operation of the governments, both on the international and on the national side, with the organs of the control was essential. For, as the Committee has said, "neither the Committee nor the League is in a position to grapple with this colossal problem except to the extent they are aided by governments"; and the strong interest of governments, backed by their peoples, in their domestic problem made them willing to accept the limitations on their sovereignty which experience showed were necessary if the campaign was to succeed.

It has always been recognized that universality was the goal to be aimed at and that, unless all the countries were bound by limiting conventions, there was always danger that there would be created a pool of drugs from which the smugglers could get their supplies. But universality by the normal method of all countries signing the convention is hard to accomplish, and other means had to be devised to check the non-member countries. The influence of the League, and now of the United Nations, has been used as a means of getting countries to sign the conventions. The Council of the League, and now the Economic and Social Council of the United Nations, have reminded governments of the importance of signing the succeeding conventions and have kept a gentle pressure upon them at the request of the Opium Advisory Committee, now the Narcotics Commission. It is one of the many services which the League and the United Nations, as over-all international bodies, are able to render specialized controls such as that of narcotics.

Even without the ideal condition of universal acceptance, however, the system of estimates, which is put in effect through the Supervisory Body, establishes a method of control extending throughout the world over non-signatory as well as signatory governments. Any State, signatory or non-signatory, may send in its estimate for the amount of its needs for the year and, if it does not send in an estimate, the Supervisory Body will make an estimate for it, which will then be binding. Shipments of drugs can be made only to a State within the limits of the estimate, and if the Permanent Central Opium Board, as a judicial body, determines at any time that the limit of the estimates has been reached, it will notify the States and they are bound not to make shipments which will exceed the estimates.

The Board has another means of checking on non-member as well as member States. If it finds that there is accumulating, in any country, an amount of drugs which constitutes a danger, it may notify the other States, and shipment in such case will again be stopped. Non-member governments are of course not bound to observe the rules of the conventions or the decisions of the Board; but so long as the principal drug-manufacturing countries are signatory the limitations are effective on even non-signatory States, and so a universal world-wide effect is given to the conventions. If, of course, a State which produces opium has, at the same time, factories for the transforming of the opium into drugs, another means of assuring limitation would have to be adopted, and that the Board has at its disposal. It may request a government, whether signatory or non-signatory, to come before it and to explain a condition which, in the opinion of the Board, makes it likely that there will be improper accumulation of stocks. This procedure can only be successful if the Board has great prestige, a reputation for fairness and, at its back, the influence of governments which are sincerely interested in narcotics control. All of these prerequisites are possessed by the Board. In one well-known case of a non-signatory government which was both a producer of opium and a manufacturer of narcotics, the Board requested its appearance to explain a situation threatening to the narcotics control. The government appeared and promised that it would give up manufacture, pass satisfactory legislation, and would sign and ratify the narcotics conventions. It was as good as its word.

The Supervisory Body, in preparing its estimates, does not have the right to modify the estimates of a government, but it can bring about the same result in a less drastic manner. It has the right to make inquiries in respect to the estimates as a whole, or an estimate as to any particular drug, and the governments questioned have, for the most part, given the required explanations. Knowing that it would have to explain its estimates and explain them to a group of men, both in the Secretariat and on the Supervisory Body, familiar with the subject and who have been watching their returns for years, a government is apt to be careful in preparing its report; but it might be less so if the power of checking did not rest in the international organization. The weapon of publicity can be used in all these instances. The reports of the Supervisory Body are public and so are the reports of the Permanent Central Opium Board. Governments are not willing to seem unco-operative with an international agency engaged in carrying out an international social duty of such importance.

Another means of enforcement, by publicity again, is through the reports formerly made by the Opium Advisory Committee, the Permanent Central Opium Board and the Supervisory Body to the Council and Assembly of the League of Nations, and now to the Economic and Social Council and the General Assembly of the United Nations. These reports are public and,

more than that, they may be the subject of discussion in either of the two bodies, so that any Member of the United Nations, or any non-member which has not observed its duties under the opium treaties, may be brought to book in the ECOSOC or in the Committee of the General Assembly to which these reports are submitted and where they are discussed. Such publicity, based on well established facts, set forth in that great world forum, would be hard for a government to face. It must be used with great care, however, and informal methods have proved far more satisfactory in the settlement of the questions which have arisen in the course of the administration of the treaties.

It is well to have power, whether that of publicity or that of possible administrative action; but it has been found in the national administrative field, as well as in the international, that persuasion is an arm which accomplishes better results, though it may not accomplish them so quickly. Great tact and understanding must be his who would successfully share in administering the international opium control. Governments and their representatives are sensitive, both to their standing internationally and to their standing among their own people, and an international administrator must have in mind not only the international situation but the national one, and must understand how to bring persuasion and pressures to bear which will not either destroy the personal standing of the man with whom he is negotiating or the standing of his government. He must, however, know when to apply public pressure, as in the case of the country mentioned above which was brought before the Board, and he must know what particular pressure is best fitted in a particular situation.

Another method, useful in all international administrative matters, is the diplomatic pressure of interested governments. In a difficult situation, a government which has relationships with the government which causes the trouble may suggest that public opinion in its country is concerned, and it would be well for the offending government to take into consideration its public relations and the harm that may come to its good name, and to its international relations, if it persists in the course it appears to be taking. The use of this method helps make effective international organization as a means of keeping order in the international society and maintaining the instruments that society has established to carry out its purposes.

A useful device for securing universal application of the control is the system of import and export certificates, by which a close check can be kept on the international legitimate trade in narcotics and on the possibility of an accumulation of narcotics in any one country. If no shipments could be sent from any country to another without an import certificate from the government of the receiving country and an export certificate from the government of the sending country—with the power of the Board to check on export and import certificates so that it would have an automatic means of watching the trade, and with its power as a quasi-judicial body to bring about a cessation of exports to a country exceeding its quota—there would be little danger of great leakage from the legitimate trade. This system can be extended, in its effect, to non-member countries by the device of requiring member countries not to allow drugs to be sent to non-member countries unless they have, in effect, the same system of watching their legitimate trade. The import and export certificate system, too, is a good means of keeping national narcotic officials informed of imports and giving them a means of checking on the illegitimate traffic.

III. The Struggle Against Illicit Activities

The reports on seizures made by governments are a valuable means of checking on the illegal traffickers. They indicate the extent of the traffic and the regions from which the traffic flows, so that closer watch can be kept on suspected territories. They have been useful in bringing specific situations to the attention of governments which had been lax in passing legislation, and so caused them to tighten up their laws. This procedure has, however, been rendered less important with the success of the programme and the improvement in national legislation and administration. Formerly, one of the principal sources of the traffickers was leaks from the regular trade facilitated, especially at first, by the laxity of legislation and laxity of administration, a more important element as legislation improved. Under the steady pressure of the international administration and of the interested governments, this source of the illicit trade has been cut down. It has already been pointed out how a non-signatory country had begun manufacture openly and how it was checked. In the same way other countries had been brought into agreement and open manufacturing fairly well controlled, but now the great danger is from clandestine factories, so that the origin of seized drugs is not so easy to determine.

A serious instance of the rise of the clandestine factory was in the Far East. There, under the Japanese control of Western China, clandestine factories appear to have been encouraged by the occupation authorities and their satellites, and a flood of drugs not only entered the illicit market of China, but also found their way to Western European countries and particularly to the United States, always the best market at the highest prices for smugglers. In Korea, a factory had been established under Japanese Government auspices, whence came drugs used in the illicit trade in Manchuria and North China, and swelling the traffic to the United States and Canada and Europe. Formerly drugs had gone from the West to the East, but if the East Asiatic governments are not able, or do not show the will, to join effectively in the world-wide campaign, the tide will be reversed and the

traffickers will find their chief source of supply in the Orient.

The powerful international organization of the illicit traffic called into being an international police organization to control it. Its size and wealth are indicated by the fact that persons associated with it sought out countries in which factories could be established to manufacture its drugs, and when these were closed by the action of the international authority, it financed and operated the clandestine factories required for its supply. It is organized into large and well financed groups, operating in many countries and well supplied with money from its enormous profits and from the capital which adventurous traffickers were able to contribute. Scattered as was its management, the transactions of its chiefs were not easily discovered by the police of any single country, and it used its resources freely in bribery of officials where possible. Only recently, there was developed, by the traffickers, a business in opium and its derivatives in a country close to another which was a rich market, escaping for some time the eye of the government in whose territory it was operating. That operation, including the growing of opium, its transformation into certain drugs, would not have been worth while except for the organization of the means of transport and of sale in the illicit market in other countries. This factor of clandestine production and manufacture has created new difficulties and has raised the question of giving to the Commission power of inspection which it has never had. Inspection is a difficult weapon to use in a world of independent governments. It is never popular; no government likes to have international inspectors in its territory. International inspection would imply a failure of the government itself to live up to its obligations; and if it had to be used frequently, the very fact would show that the control was weakening, nor would it be easy to carry out where the problem was that of unearthing clandestine factories, often small and carefully hidden. It could be useful in the other field, that of discovering whether there was an excess production of opium. The poppy fields flamboyantly proclaim their presence with their gay coloured flowers and would be easily identified from an airplane without interference, as in the cases of factories, with the life of the country. The fact of opium growing could be easily established in this way and brought to the attention of the international authorities for discussion in their meetings, and the country which allowed it would be subjected to the weapon of publicity. The right of inspection would have to be used with great care and sparingly, but the international administration of the narcotics control can be trusted with it, and it might, on occasion, serve the useful purpose of providing material for discussion at meetings of the Board or of the Commission, on which to base requests for action to a government lax in its administration. The change in the dependence of the illicit market on clandestine production, may well make important an inspection which might make it easier for the national administtation itself to discover and act against clandestine manufacture.

It is only with the co-operation of governments that the international control can succeed. The governments send in the information on which the control depends. They report seizures, they agree to insist on import and export certificates and to obey the judicial recommendations of the Board. They provide the statistics of use of drugs for their countries on forms prescribed by the Supervisory Body, and they are bound to explain their own statistics and to accept, as a basis for action, the estimates fixed by the Supervisory Body not only for signatory countries but for non-signatory countries as well. Statistics needed for the work of the control are not always sent in on time. While narcotics bulk large in the minds of those who are interested, it has not always an equal importance in the minds of government officers, busy with many matters more important to them than narcotics, so the secretariat and the officers of the control must be on the alert to assure the flow of the information which is the life blood of the control.

They have another function, basic to international action. Narcotics control would not be possible except by control of individuals, which can only be carried out through the action of governments. The treaties contain closely detailed international standards defining narcotic drugs and prescribing the method of control of their manufacture, their shipment in international trade, their use in internal trade, even going so far as to prohibit the unlawful possession by individuals. It is not too much to say that the narcotics conventions lay down the international law of narcotics as the Universal Postal Convention lays down the international law of the posts, and that the signatory governments are bound to enforce this law by legislative action putting it into force, each within its own jurisdiction. The administrative side of the government is bound to enforce these acts and to have the aid of the judicial branch in imposing the penalties prescribed by the national legislature.

Thus, through the governments, the international rule finds application to individuals in different countries, and its enforcement is based on the interest of the people in the countries and their governments in meeting the menace of narcotic addiction. A government, to meet its obligations under the conventions, must have legislative, executive and judicial power, which must be put at the service of the world-wide programme: without this foundation, a firmly laid programme would crumble.

Not the least important of the duties of a government is the adequate punishment of violators of the narcotics law. Unless there is a severe corporal punishment of offenders the effectiveness of the laws will be much lessened. Fines are looked at by the rich gangs which control the traffic as a sort of license for which they can readily

pay in the case of the minor traffickers who actually sell the drug to individuals. Unless prison sentences are meted out, and these in proportion to the importance of the offence, the laws lose much of their effect, and thus the check on the traffic in a country will become weak. However, as each country is a necessary link in the chain, the result is that there is an international interest in severe punishment. A crime against the narcotic laws in any country thus becomes a matter of international concern.

Recognizing this, the Treaty of 1936 has bound governments to punish, with severe prison sentence, breaches of the narcotic law. But that is not enough. Narcotics crimes, carried out in several countries by different individuals who keep away from the country of illicit sale, require co-operation among the law enforcement officers to get the evidence and produce it in the proper court. The farflung system of the traffickers also requires close co-operation between enforcement officers of different countries in the process of discovering and apprehending the criminals and getting information which leads to the seizures of drugs shipped from one country to another where they are destined for sale. Long before the Treaty was prepared, enforcement officers had been in close touch with one another and had thus spread an international police net which alone could be effective against the elusive and well advised malefactors who operated as great gangs.

International organization, based as it is on governments, needs to provide means of securing action through the governments. The means provided in the narcotics conventions and through the United Nations, have been referred to and their wise and temperate use has been the basis of its success, backed by its great weapon of publicity. At first, when the problem was to ensure satisfactory legislation, the information brought out by seizures, and discussed in the Commission, made apparent the failure of certain governments, even well disposed, to pass legislation which would close the door of the legitimate trade to leaks, and which would carry out the national obligations to enact and carry through the engagements of the government. With the setting up of the Permanent Central Opium Board, an effective instrument for watching international trade was set up with the power to call governments, signatory or non-signatory, before it, and to issue requests to governments which they agreed to follow. Armed with these powers, it has been effective by its informal negotiation and has met, in this way, the delicate problems of enforcement. Within a certain country a new manufacture of drugs was started after the traffickers had found their supplies greatly diminished by action of other countries. It was believed that the traffickers themselves had started this enterprise, and the government, when approached by the Board, finally agreed to close the factory. Only recently a flourishing business of growing poppies, and converting raw opium into drugs for sale in the illicit market, was uncovered in a country and, by prudent negotiation involving co-operation with interested governments, the danger was met through the Opium Commission by negotiation, which made the government a willing co-operator in checking the thriving trade.

IV. Methods of International Action

The steady improvement in the structure and the powers of the narcotics control is owed, in large measure, to the work of the organization through members of its agencies and of its staff. They have been steadily occupied with carrying out the powers granted by the successive conventions, and thus have been made conscious of defects in the treaties by the lessons of that great teacher, "Experience". The Opium Advisory Committee was set up to advise the Council and Assembly of the League, and it was natural that it should have the task of preparing drafts of new treaties under the ægis of the League. This procedure was different from that of the preparation for the Treaty of 1912, when there was no agency entrusted with the preparation and it was left to an interested government to take that responsibility and also to call the conference.

Thus, the preparation of the treaties was in the hands of the administrative agencies charged with their application, familiar with the problems involved and acquainted not only with the difficulties of the control itself, but with the attitudes of different governments which would have to, eventually, pass on the draft that would be submitted. The same experienced group had the task of collecting the material on which the proposal was based, the reasons for changes, and why the proposals for modification were likely to produce the results expected of them. Proposals were debated in the Committee, advised by its staff, and, as the members of the Committee represented governments, points of view of different important governments could be taken into consideration during this preliminary work, and the members of the Commission could consult their own governments on the policy involved and even the detail of different proposals. When the draft was completed, it was passed on to the Council of the League, and the Council, if it thought the time appropriate, would call a conference of interested countries to which the proposals would be submitted, with their accompanying data. The conference had thus started with a carefully prepared plan, supported by material prepared by a competent staff, on which to work.

The proposals of the OAC were not, by any means, always accepted by the conferences, which sometimes made material changes, but they were well informed of the problems and policies involved before a start was made on the conference.

There was another step taken in the League procedure. Proposals were communicated to governments for their

comments, so that there was not only the judgment of the Opium Advisory Committee, but that judgment, corrected by the governments, contained in the final draft which went to the conference. An even shorter procedure was followed in the Protocol adjusting the treaties to the new state of things when the League ended and the United Nations took over. The draft was prepared by the secretariat, the members of the Commission were consulted, the draft submitted to the Economic and Social Council for its approval, and then sent to the General Assembly. Governments were asked to give their representatives in the General Assembly full powers to sign the convention if approved by the General Assembly, and thus avoid the step of an international convention. The General Assembly approved the draft. Many of the Members signed and the Protocol was then sent to those countries which had not signed, with a request that they approve it. Until governments had signed and ratified, the instrument was not in effect as a treaty. This procedure comes close to direct international legislation by the General Assembly, subject to subsequent signature and ratification by the governments. Non-member States may be asked to approve, though they, of course, are not in the position of having had their representatives in the body which passed upon the proposed convention. This procedure had been in use in the League in a few cases, some much more important than the Protocol, for example, the Slavery Convention of 1926. It has advantages over calling a conference for a new discussion of a draft which the governments have already approved, and it represents a great saving in time and expense. On the other hand, a special conference devoting itself exclusively to a particular treaty will give it closer attention than it was likely to receive in the committees or on the floor of the General Assembly, and it does not seem likely that important conventions in respect to which there is a real conflict will be withheld from special conferences.

The proposed convention to include, in one document, the narcotic law will probably go to a special conference, but that conference will have before it a carefully prepared draft with supporting materials, and that draft will have a great influence on members of the conference. It will incorporate the best judgment of the staff and of the Commission with the aid of the members of the Board. This method of preparing international legislation is possible only because of the existence of an over-all international organization like the United Nations. It is an important contribution toward better prepared international legislation in the economic and social fields. Just as in the case of national laws in these fields, so in international legislation there is need, as the narcotics treaties show, for continual change to adjust the provisions of the law to new situations, as for example, new kinds of drugs which have been developed, the need for control of raw materials and to improve the administration. The same procedure applies in respect to national laws. As has been the case in the drug control, it is the national administrative agencies in charge of particular activities which are accustomed to take the lead in suggesting improvements in legislation, both as to substance and as to administrative devices, and the law-making body has been accustomed to take their proposals into consideration.

This procedure, developed through the League and the United Nations, is a substantial contribution to the organization of the international society. Under the old procedure some government had to be persuaded to assume the responsibility of calling a conference and had the labour of preparing the agenda and the preparatory materials necessary for its work. There was no international staff or international administrative authority working steadily on the problem and familiar with its intricacies. The international authority, too, has the further interest that it will be charged with the duty of carrying out the new convention, so that it will be concerned with the practicability of its proposals in an administrative sense.

The preparation of drafts of new conventions and of amendments is a task which calls for patience and for compromise. It cannot be quickly done where important changes are suggested. Consideration must be given to habits and prejudices in member countries in all quarters of the globe. There must be negotiations with governments, there must be consideration not only of what is desirable but of what is possible and of the extent to which different governments can go in breaking down habits of their people. A good example is the long-continued campaign against smoking opium, which was at first permitted under the convention and then limited and, finally, by the vigorous efforts of governments and of the narcotics control during the war, has been abolished in eastern Asiatic countries which at first were unwilling to act and which derived a considerable revenue from opium taxes and licences. Steady pressure of other governments and, above all, of public opinion, together with the accumulating evidence of the harm done by the vice, made this accomplishment possible.

Under the Convention of 1931, certain types of new drugs made from opium or coca leaf might be brought under control by a decision of the World Health Organization, which would be binding on member States; but recently other synthetic drugs have been discovered which are habit forming and should be subject to the machinery of the international narcotics control. The Commission, acting through the processes of the United Nations, proposed a protocol to this effect. The Economic and Social Council and the General Assembly approved it, and it was sent to governments for their ratification. Under its provisions the World Health Organization will decide whether the drug is habit forming and its decision will be final, an application of the Convention of 1931 in a wider field.

V. New Developments

New synthetic drugs will bring new problems of control and especially that of discovering and stopping operations of clandestine factories not dependent on opium or coca leaves for their basic materials. The controls now in use can be employed against leaks from the legitimate trade, but the new drugs will involve questions of control, in the national chemical trade, differing from the control of opium and coca leaves, as these are usually imported by manufacturing countries. Clandestine factories making these drugs will be a problem, administratively, for the national governments bound to suppress them by the international treaty law. The system of control shows its soundness in this example of the way it can be extended to new materials and to varying situations as the need develops.

Another example is the applicability of the system of estimates to another problem, that of the production of crude opium, which has long engaged the attention of interested people and of narcotics authorities. It has been realized, as a result of long experience, that, until production is under control and limited to the amount of crude opium needed for medical and scientific purposes, there will be a surplus from which illicit smoking opium and narcotic drugs will be produced, despite the best endeavours of the international and national agencies. If estimates were sent to the Supervisory Body of the amount of crude opium and coca leaves which each manufacturing country would require, both to supply its home market and its customers, an amount checked by the estimates of the need for drugs each country now furnishes, the total world consumption of crude opium could be fixed and an apportionment of the raw material be made among manufacturing countries.

Very real conflicts of interest arise, however, in the organization of the producing countries. Opium producers have seen their product cut down by the campaign against traffickers, their largest outlet. Some of them have co-operated loyally in the restriction of the supply of drugs and often at substantial economic loss to the governments and to their people who plant the poppy. They are also threatened by the development of a new process which makes it possible to extract opium from the straw of the poppy plant, widely extending the area within which crude opium can be produced.

Synthetic drugs also have played their part in the threat to the prosperity of the industry. It is natural, therefore, that the governments of the principal opium producing countries should press for a share of the opium trade and should be concerned with opium production by the new process. The manufacturers are interested in a steady supply and in a fair price, and so are the physicians who use the opium drugs in their practice. Since the crude opium is not needed in very large quantities, and since the price of the crude opium does not play a very large part in the ultimate cost of the drug, the play of competition among the producing countries is not important, provided the price can be maintained at a figure that does not become exorbitant.

Consumers, however, may not unnaturally be expected to oppose an uncontrolled monopoly by the producing countries, which would result if the production of opium from straw were given up—so that the drug would have to come from a relatively few producing areas—thus making control easier. Some form of control of the world opium market is indicated in the interest of both the producer and the consumer, so that a supply will be forthcoming each year at a reasonable price, and the amount of crude opium processed be limited to the requirements for the legitimate trade.

Essential to any settlement of the problem is agreement among the producing countries as to the division of the market and the setting up of some way of determining the price, in which both the producers and consumers will feel confidence. The result of such a plan, if sincerely enforced by producers, would be to cut the supply of opium from the clandestine factories and to check the sale of opium for other than drug purposes, such as smoking, results which are vital to the final success of the long campaign against the traffickers. Producers might be inclined to accept such a plan to save their remaining market, especially if there could be agreement to cease production from poppy straw. Stopping poppy straw production would help in the control, as production would then be concentrated in a few countries which should be willing to submit to limited oversight. For exampie, it would be possible, by airplane, to check how much land was being cultivated, and where, and to check on the care each government was showing in its limitation campaign.

It has been charactertistic of the work of the organization that it has kept away from political influences except those directly involved in the subject matter of its activity. In the one case of Franco Spain political reasons led to the exclusion of a country whose record of observance of the treaties has been good and which has accepted their restraints, even though no longer a member. The spirit of exclusion, contrary to that of universality, must be guarded against if the international narcotic organization is to protect the people of the world, as it is intended to do.

The serious power struggles which so disturb the society of nations have not prevented the control from continuing its progress, and the new States which have arisen, especially in the East, have joined its ranks and so have bound themselves to keep its statutes. There has been excessive production of opium in several of them, and clandestine manufacture has spread in at least one.

The next years will be difficult. Opium revenues, licit and illicit, are tempting, enforcement of narcotic laws is hard and costly. Their administrative organization will be under a strain, and it will not be easy to meet the standards which have been set up internationally. Their peoples have suffered in the past from the evil of narcotism; they have therefore a strong interest in the success of a movement which will have so much effect on the economic betterment of their people.

The League played a very important part in the development of the narcotics control, so important that it is doubtful whether the great advance made would have been possible without the influence of its agencies and the great value of the secretariat. The Opium Advisory Committee was a League agency. The League supplied it with the staff without which it could not have functioned, and the fact that there was behind it the great sounding board of the League, through the Council and through the Assembly, gave it an invaluable means of influencing governments and of informing public opinion. The United Nations, with the General Assembly and the Economic and Social Council, has succeeded the League. It has shown appreciation of the work done in narcotics, which makes it evident that the support given by the League will be continued under the United Nations.

The Suppression of Poppy Cultivation in the United States

How the Cultivation Began and Ended

The poppy cultivated in many parts of the world, and especially in Europe, for its edible and oil-bearing seeds, is the very same species—*Papaver somniferum*—as the poppy cultivated for opium in many other parts of the world. In fact, the same poppy plant can be used to obtain both opium and edible seeds. In the United States there has never been much commercial cultivation of this plant. Poppy-seed for food has been imported from Europe, 3,000 tons or more a year; in 1938 nearly 4,400 metric tons, chiefly shipped from the Netherlands, Poland and Danzig. This importation was almost entirely cut off by the war, and the price of poppy-seed soared from 7 cents a pound to 50 cents a pound and even more. Many farmers saw the possibility of enormous profit, and plantings of the poppy rapidly increased, especially in California. Although there was no immediate question of opium production, the occasional abusive use of the capsules had already attracted attention, and in any case the Narcotics Bureau of the United States was quite unwilling to see the cultivation of the opium poppy extended far and wide over the country, with the potentiality of narcotic evils in its wake. In response, Congress passed the Opium Poppy Control Act of 1942, making it unlawful for any person to produce the opium poppy except under licence, and licences were to be issued only if necessary to supply the medical and scientific needs of the United States for opium or opium products. The California growers, on the plea that their crop had been planted in the early winter of 1942, just before the law was passed, were allowed to harvest their crop of poppy-seed in the summer of 1943. The understanding of the Narcotics Bureau was, of course, that this concession would never be repeated nor even asked for again. But some of the growers did not stop. Under California law any person of good moral character could obtain a state permit to cultivate the opium poppy. With tremendous profits envisaged and their state permits as at least a talking-point, some of the growers again planted poppy-fields in the fall of 1943. In the following spring, the authorities of the Narcotics Bureau first attempted by persuasion to have the poppies ploughed up, and finally moved to have the remaining crops seized and destroyed. The growers, who were still resisting, then brought the case to Federal Court, alleging that the Opium Poppy Control Act was unconstitutional, that control over a food plant rested solely with the state. The case was heard by a statutory emergency court composed of a Circuit Judge and two District Judges. The Narcotics Bureau and the District Attorney based their argument for constitutionality of the law squarely upon the treaty-making power of the Federal Government; in particular, the right of Congress to legislate, even contrary to state laws, in furtherance of the International Opium Convention of 1912. On 28 August 1944 the three judges handed down a unanimous decision holding the Opium Poppy Control Act constitutional. Soon after, the growers decided not to appeal to the Supreme Court of the United States. Thus ended the California "Poppy Rebellion".

These events will now be reviewed with many more details given; however, personal names are in general omitted.

The Pre-war Situation

From 1935 to 1940, the files of the Narcotics Bureau showed only a scattering of letters regarding the cultivation of the poppy, most of them inquiring what regulations would have to be complied with. Some inquirers thought that the United States ought to produce its own opium; others were desirous of producing poppy-seed.

The Narcotics Bureau tried to discourage both. The Bureau, at this time, held that anyone growing the opium poppy for any purpose would have to register as a producer of narcotics, and perhaps have to comply with many other regulations. So far as known, all who actually corresponded with the Bureau during this period were effectively discouraged from taking up poppy culture.

Many immigrants from Central Europe, however, especially from Czechoslovakia, grew poppies in their own kitchen gardens without ever thinking about the possi-

bility that the narcotics enforcement authorities might object. An investigation of the situation in Minnesota had been made, but no action was taken: the Narcotics Bureau preferred to ignore these non-commercial kitchen-garden plots, rather than call attention to the possibilities of cultivating the opium poppy in this country.

Legal Situation when Commercial Cultivation Began

The situation changed when commercial production of poppy-seed began, but still no action was taken to register the growers as narcotic producers. Some legal experts thought this was not within the intent of the Harrison Act of 1914, and in any case the requirement of registration of producers and payment of an annual occupational tax would have done little good. The tax was only $24 per year; the provision, if rigidly enforced, would have ended the cultivation in home gardens but would have only given governmental sanction to large-scale commercial cultivation. The Narcotics Bureau, therefore, at first tried to discourage growers or appealed to them to discontinue poppy cultivation; and when these measures were no longer effective, sought new legislation from Congress and, in some cases, in the states.

In April 1941 the Bureau was notified, by a California seed company which had asked for official permission to grow the poppy and been dissuaded from it, that a number of their competitors and other seed growers were already producers of poppy-seed, and that the cultivation was rapidly increasing. The Commissioner of Narcotics at once ordered an investigation, and directed his District Supervisor of Narcotics to confer with the Chief of the Division of Narcotics Enforcement of the State of California, and if possible arrange for the destruction of the crops of the opium poppy.

The State of California had its own narcotics law, but the state authorities considered that no provisions in it covered the cultivation of the opium poppy. At the time, the state legislature was reconsidering some aspects of the law, and the Narcotics Bureau suggested an amendment requiring a licence for any grower of the opium poppy. The California legislature adopted an amendment on the subject in 1941, but it required only a "permit" instead of a "licence". The state authorities later considered themselves bound to issue these permits to any applicants who were qualified under the state law. This soon made the situation worse than before enactment of the legislation.

A Case of Narcotic Use of the Capsules

In May 1941, a narcotics inspector and a customs officer investigated a report that a Hindu near Holtville, California, was growing the opium poppy. They at first reported that the poppies were only a floral variety, but they were sent back to get some pods for analysis. After analyses showed the presence of morphine, they went back again and now they discovered that the grower had been boiling the pods with his coffee, in the belief that they gave him greater strength for work in the fields. He was a farm labourer of good repute and had no idea he was violating any law; he had learned the custom of drinking an infusion of poppy pods in India. No action was taken against him except that the poppies and the harvested pods were destroyed.

This case made the officials of the Narcotics Bureau more determined than ever not to permit an enormous increase in the cultivation of the opium poppy in California, even though most growers were interested only in the seed. Some years earlier, the abusive use of poppy capsules had spread amongst the addicts farther north, in the State of Washington and in British Columbia, Canada. These abuses had been suppressed under the narcotics laws of the United States and Canada, but it seemed only too likely that they would spring up again in California, if unrestricted poppy cultivation were permitted there.

Investigations in 1941

The investigation in the summer of 1941 showed that most of the poppy growing was in the Santa Maria Valley, not far from the well-known port of San Luis Obispo. Here is a district about twenty-five miles long, two to ten miles broad, one of the richest and most fertile parts of agricultural California, devoted almost entirely to the growing of vegetables and flowers for seed. A number of seed companies obtained their supplies here, the seeds being packaged and sold to gardeners all over the United States. Here, floral varieties of *Papaver somniferum* and other poppies had been grown for many years. These experienced growers, attracted by the high price, had begun growing the "Holland Blue" or "Dutch Edible" Poppy (kitchen-garden varieties of *Papaver somniferum*) to meet the demands of bakeries for poppy-seed, a demand no longer met by imports.

These highly reputable growers collaborated willingly with the investigators of the Narcotics Bureau. Nothing was taken for granted as to the character of the poppies: samples were secured and chemical analyses made. Not only the kitchen-garden variety "Holland Blue" (which is a blue-seeded, not a blue-flowered poppy), but also such floral varieties as "Tall Paeony Flowered Double" and "Mikado Carnation" were analysed and found to contain morphine. A "Persian Poppy" was also found to contain morphine. These are all varieties of *Papaver somniferum*. The "Flanders Poppy" or "American Legion Poppy" was examined without any morphine being found: this is a variety of *Papaver rhoeas*. Later, other varieties and species were examined, including of course the California Poppy, the state flower of California (*Eschscholzia californica*). Morphine was not found in any other species than *Papaver somniferum*.

There were a little over six acres of poppies grown in the valley for flower seeds, and 175 acres for the commercial production of edible poppy-seed.

At the request of the Narcotics Bureau, the flower-seed companies agreed to discontinue their listing of morphine-containing poppies, varieties of *Papaver somniferum* generally listed as "Tall Annual Poppies" in the seed catalogues. These plants were destroyed and the seeds were not saved.

The seed intended for the bakery trade was allowed to be sold. The residual plant material was destroyed under supervision of state and Federal narcotics officers. The growers were asked not to save any seed for future crops. They were also notified that new legislation was being sought. The Commissioner of Narcotics wrote to his District Supervisor: "We should make all proper effort to discourage and if possible prevent the production of the opium poppy because of the dangerous potentiality incident to such a widespread supply of source material for morphine, which may, of course, lead to correspondingly extensive abuses".

At this same time—July 1941—an Oregon newspaper editor wrote enthusiastically of the beginning of poppy culture there. It had been introduced by a former resident of Czechoslovakia, who sowed eighty acres in poppies on his Oregon farm, forty in the spring and forty in the autumn. The Commissioner of Narcotics wrote pointing out the dangers inherent in increased poppy cultivation; the editor replied that they had not thought of any but agricultural possibilities. The Commissioner asked that no further encouragement be given to poppy growing and said that the Narcotics Bureau wanted no publicity on the subject until proposed legislation was further along.

This last point was apparently not well understood in California. The state narcotics enforcement office prepared a Press release publicizing the destruction of the morphine-containing plant material and the representatives of the Federal Narcotics Bureau even co-operated in allowing photographs and publicity information to be given to the newspapers. Considering the lack of real legal control over poppy cultivation for seed, the publicity obtained was unfortunate, dangerous, and potentially very harmful. The newspapers seized the opportunity for sensation. Here are some headlines that appeared:

"Bakers, Not Dope Peddlers, Get State's Poppyseed Crop"

"Worry On Opium Poppy Crop Ends"

"State Harvests 'Opium Crop'—Under Law's Eyes"

"State Smashes Opium Supply"

The Narcotics Bureau hoped that the worst was now over, but this was not the case.

In August 1941, the Narcotics Bureau in Washington was paid a visit by the Executive Director and General Counsel for the American Seed Trade Association. The Association wished to provide for legal or acknowledged cultivation of the poppy. The imported poppy-seed had been commercially handled in the United States by the spice trade. In December it was found that the president of a wholesale spice company in Chicago, who was also Director of the American Spice Trade Association, had been very energetically propagandizing for domestic poppy cultivation. He had directly induced twenty-two growers in different parts of the country to plant poppies for sale of the seed to his company. At this time, growers in California were planting or preparing to plant for their 1942 crop.

Later claims that the seed-producing poppy was not really an opium poppy, that it had only an insignificant amount of morphine, etc., seem to have developed from the propaganda for poppy growing rather than to have been present in the minds of the farmers from the start.

Situation in California in 1942

In California, a division of the state government, Drug and Oil Plant Development, was, at this time, urging California farmers to grow the poppy. Planting of 6,000 acres was advocated, which it was claimed would produce 6 million pounds of poppy-seed.

Actually, the State Division of Narcotics Enforcement, toward the end of 1941 or early in 1942, issued permits for the planting of 2,000 acres to opium poppy. This was apparently done without consulting or notifying the Federal authorities, and the United States Narcotics Bureau in Washington did not become aware of it until May 1942. The United States Commissioner of Narcotics had understood that a tacit agreement existed that the state would not "license" growers except by agreement with the Federal Government. The state Chief of Narcotics Enforcement explained:

"After the enactment of the amendment to the Health and Safety Code of this state, enabling us to issue permits to growers of poppies, I asked the opinion of the Attorney-General of this state as to how far we could go to curtail the planting of these poppies. I was informed that the amendments which had been proposed and enacted into law in this state legalized the growing of poppies bearing opium and that we had no recourse other than to inquire into the good moral character of the grower and satisfy ourselves that the individual was not a trafficker in narcotics."

He also pointed out that nothing further had been heard relative to pending Federal legislation to outlaw poppy growing. Actually this legislation was being prepared but the Narcotics Bureau did not wish advance publicity on it.

The poppy growers were not the same men as in the preceding year. Previously they had been seed growers for the companies marketing flower and vegetable seeds;

Poppy field beside an open road

A stack of burning poppy plants

Ploughing under the poppies

Poppies taller than a man

Poster, showing notice of seizure

in 1942 they were "practical farmers who are in the business for just as much money as they can get out of it." Most of them were now located in northern California, especially in the vicinity of Chico. A number had not had any previous experience with poppies. Some of these latter, after securing permits, did not even plant poppies, others had crop failures. It is said that only 378 acres, registered under state permits, were actually grown in this year. To these growers, however, the crop was enormously profitable.

The Commissioner of Narcotics issued an order to "warn all persons concerned of the danger, inseparably connected with the cultivation of the opium poppy for any purpose, of providing a new source of supply of contraband morphine to drug peddlers and addicts".

The poppy growers were not much impressed. They were not interested in possible narcotic dangers but in the high price of poppy-seed. Their fields were unguarded and sometimes quite open to the public road.

Capsules obtained for analyses showed, on the dry basis, from 0.25 per cent to 0.78 per cent morphine; the average was about 0.35 per cent morphine.

The Opium Poppy Control Act of 1942

The Federal poppy control bill was passed by both Houses of Congress and was signed by the President on Saturday, 12 December 1942. It was headed:

"AN ACT

"To discharge more effectively the obligations of the United States under certain treaties relating to the manufacture and distribution of narcotic drugs, by providing for domestic control of the production and distribution of the opium poppy and its products, and for other purposes."

Some of the provisions were:

"*Sec. 2 (c)*. The term 'opium poppy' includes the plant *Papaver somniferum*, any other plant which is the source of opium or opium products, and any part of any such plant.

"*Sec. 3*. It shall be unlawful for any person who is not the holder of a license authorizing him to produce the opium poppy, duly issued to him by the Secretary of the Treasury in accordance with the provisions of this Act, to produce or attempt to produce the opium poppy, or to permit the production of the opium poppy, in or upon any place owned, occupied, used, or controlled by him.

"*Sec. 6 (d)*. All licenses issued under this Act shall be limited to such number, localities, and areas as the Secretary of the Treasury shall determine to be appropriate to supply the medical and scientific needs of the United States for opium or opium products, with due regard to provision for reasonable reserves: *Provided, however*, that nothing contained in this Act shall be construed as requiring the Secretary of the Treasury to issue or renew any license or licenses under the provisions of this Act.

"*Sec. 8 (a)*. Any opium poppies which have been produced or otherwise obtained heretofore, and which may be produced or otherwise obtained hereafter in violation of any of the provisions of this Act, shall be seized by and forfeited to the United States.

"*Sec. 17*. The Act may be cited as the 'Opium Poppy Control Act of 1942'."

Effect of the Opium Poppy Control Act

In most states the Opium Poppy Control Act immediately ended commercial poppy cultivation, but in California it only produced protests and demands that the cultivation be licensed.

The law was misunderstood by some at first, and was interpreted in the same sense as the California state law, which had resulted only in expansion of the poppy culture. Thus a "United Press" dispatch published in some papers even had the heading "Opium Poppy to be grown", and went on to say: "President Roosevelt has signed legislation designed to promote production of the opium poppy in the United States, under close supervision of the Treasury and Agriculture Departments, to furnish a domestic source of supply of the narcotic for medical purposes".

The real purpose of the law was the exact opposite—not to "promote production of the opium poppy" but to end it. The Narcotics Bureau replied to inquiries as follows:

"The Opium Poppy Control Act, which was recently enacted, permits the licensing of opium poppy production only for the purpose of supplying the medical and scientific needs of the Nation for narcotic drugs. There is no immediate or presently prospective need for the growth of the opium poppy to supply medical and scientific needs, and, therefore, it is not now anticipated that any licenses will be issued."

The California growers contended that their situation had not been sufficiently taken into consideration by Congress: the law, they said, was all right for midwestern or northern growers, but their seed was already in the ground when the law was passed 11 December 1942, to say nothing of its effective date, 9 February 1943. The officials of the Narcotics Bureau had to admit some justice to this view. Privately, they blamed the state authorities who had issued permits for poppy growing, even when the legislation was before Congress. Moreover, it was now learned that the United States Department of Agriculture had approved the poppy

cultivation! Because of the war, the farmers were required to file, with this Department, their plans for the year's crop; when these plans included the production of poppy-seed for food purposes, they had been approved by the local representatives of the Department of Agriculture, without any question having been raised.

A conference was held at the Office of the Bureau of Narcotics in San Francisco on 27 January 1943. Those present were two local officials of the Bureau, the state Chief of Narcotics Enforcement, the attorney for the California Farm Bureau Federation, the Chairman of the Committee of California Poppy Growers, and sixteen growers. Nine permit-holders were not present; two wrote that they had not planted, two that they could not attend that day, and five had not been heard from at that time. The rather casual attitude of the farmers is illustrated by the explanation of one grower, without a permit, who attended the conference. He said he had not asked for the state permit as he was very busy and wished to see first whether the seed would sprout or not.

It was finally decided that the growers would be permitted to harvest their crop, under state and Federal supervision, and with destruction, as before, of all plant residues left after obtaining the seeds. Of course, neither the Federal nor the state officials anticipated that poppies would again be planted without Federal licences. The Federal officials also expected that the state permits would henceforth be refused. Both these assumptions proved to be incorrect, leading to an apparent conflict between state and Federal authority, and to the so-called "Poppy Rebellion" of California.

The Granting of State Permits

Under date of 6 July 1943, the Commissioner of Narcotics received a letter from the California Chief of the Division of Narcotics Enforcement (no longer the same man as the one who had held this office when the cases began), stating:

"You may be assured that there will be no further permits issued by this department for the growing of poppies in California, at least until the matter is entirely clarified by your department."

This promise was not destined to be fulfilled. The last clause may have indicated a hope that the Narcotics Bureau would relent and license poppy cultivation: there was considerable political pressure toward this, but the Bureau remained adamant.

Early in December 1943, the Chief of the Division of Narcotics Enforcement of California informed the Federal officials that the Attorney General of the state had handed down a decision which obliged him to issue state permits for the growing of opium poppies in California.

This decision, which led to a conflict between state and Federal authority, was not addressed to the Division of Narcotics Enforcement, but was contained in a letter to the State Director of Agriculture, in reply to an inquiry of the latter. The letter cast doubt on the Federal law:

"While the Act may be open to question in some respects as to its validity and applicability to the situation described in your letter, we do not feel that it is necessary at this time to pass on such questions. . . You state that for some years growers have been engaged in the State in the production of blue poppy seeds for edible use pursuant to the provisions of Chapter 1, Division 10, of the Health and Safety Code. It appears from your letter that the variety so grown is distinct from that grown for the production of opium. It is suggested that while such poppy may come within the classification of *Papaver Somniferum,* it is actually not suitable for producing opium . . . licenses could not be issued under the Federal law . . . the foregoing reasons do not seem to be sufficient under the provisions of said sections for denying the issuance of a state permit."

The state Narcotic Enforcement Office decided that they were obliged to issue state "permits", but attached the following warning to them:

"WARNING: In issuing this permit, attention is called to the fact that you are in no way absolved from the provisions of Public Law No. 797, known as the "Opium Poppy Control Act of 1942", which Act makes it unlawful to grow the opium poppy plant in the United States except under license from the United States Treasury Department, and provides penalties for violations thereof."

The office of the Attorney-General of California attempted to get this "warning" clause left off the permits, because it might seem to make a permit "conditional", but apparently it was retained. At any rate, the growers were also warned by the United States Narcotics Bureau, as will shortly be related.

As of 5 February 1944, the state Division of Narcotic Enforcement had issued twenty-three permits to grow a total of 1,310 acres of opium poppies.

Propaganda for Poppy Cultivation

Heretofore the growers had generally conceded that their poppies were opium poppies, i.e., capable of producing opium, though not actually used for that purpose. The statement in the Attorney-General's letter, that the seed-producing poppy "is actually not suitable for producing opium", though not originating in his office, marked the inauguration of an intensified campaign to convince the public and Congress of the complete harmlessness of the seed-producing poppy—even in defiance of the facts—and to force the Narcotics Bureau to withdraw its opposition to poppy cultivation.

Some of the propagandists were self-deceived; some of the growers were undoubtedly convinced because they were now being told what they wanted to believe. The letter to the Attorney-General in November 1943 from the state Department of Agriculture had actually stated, "Apparently, under California climatic conditions, the morphine content is practically non-existent". Already, in December 1943, an official of the state Department of Agriculture admitted, "We might have been a little over optimistic as to the lack of morphine content in said poppies"—but the campaign kept on.

In February 1944, one of the growers wrote to the local office of the Narcotics Bureau: "We were advised by our State Attorney-General's Office, by the State Department of Agriculture and by the University of California, that, because of recent analyses, it is questionable (owing to the lack of opium products in our California adapted edible blue-poppy seed) [*sic*] whether we need any permit of any nature".

The issue, really a straight-out one of law observance, was being confused in many ways. Of course, the narcotics officials had not claimed that the poppy *seed* was narcotic, only that narcotics were inevitably produced in producing the poppy-seed. Even this was now being denied: a commercial chemical laboratory was found in San Francisco, which, with no previous experience in analysing for morphine, made a perfunctory examination of poppy capsules and stems, and was then willing to report, "we can find no trace of morphine".

Poppy growers wrote to their Congressmen, and several wrote to Henry Wallace, then Vice-President, whose interest in agricultural subjects was well known, asking them to intervene in favour of poppy cultivation. One letter to the Vice-President declared:

"Men in both the Federal and State Narcotic Bureau personnel have admitted that, under the most favourable conditions conceivable, it would not be possible to extract opium or morphine profitably from the Edible Blue Poppy Seed plants grown in California".

The U. S. Narcotics Bureau was, of course, unaware of any such "admissions". So far as the contention had any basis in fact, it may have referred to statements that the *legal* commercial production of opium could not profitably be made, for the *legitimate market;* but what was feared was *illicit* production for the *illicit market,* in which narcotics commanded prices many times higher than the values in the legal trade.

"The Opium Poppy and Other Poppies"

In 1943, by direction of the Commissioner of Narcotics, a scientific study was made, chiefly, though not entirely, from the published literature, on *Papaver somniferum* and other poppies. It was shown that all varieties of *Papaver somniferum* that have been examined produce morphine, while no other plant is known to do so. The reported isolation of morphine in the guise of "hopeine" from hops, in the last century, was a fraud and a myth. A few erroneous analyses of some plants of the poppy family were made in the early days, but these were later corrected. It is probable that *Papaver setigerum*—the closest relative of *Papaver somniferum*—does produce morphine, but no record of a careful botano-chemical study was found. In any case, *Papaver setigerum* is only a rather rare wild flower, found in the Mediterranean region, occasionally grown in gardens but not grown commercially even for floral purposes. Other poppies, such as the California poppy (*Eschscholzia californica*), the Mexican poppy (*Argemone mexicana*), the Oriental poppy (*Papaver orientale*), and the common "corn poppy" or "field poppy" of Europe, the progenitor of the Shirley poppies (*Papaver rhoeas*), have been analysed and other kinds of alkaloids found in them, but not morphine. By original work it was shown that the Tulip poppy (*Papaver glaucum*), though listed as a close relative of *Papaver somniferum,* is chemically more closely related to *Papaver rhoeas,* and contains no morphine.

The study was published by the United States Treasury Department, Bureau of Narcotics, in 1944, under the title of "The Opium Poppy and Other Poppies".

Enforcement Measures Taken by the Narcotics Bureau

In the beginning the Narcotics Bureau had proceeded largely by suasion, because there was not a firm legal basis for more vigorous action. Even after the Opium Poppy Control Act came into effect, the California farmers had been allowed to harvest their poppy-seed, because cultivation had been started before the law was enacted, and the violations were not wilful. Now the violations were wilful—though supported, to a degree, by some state officials—and it was evident that effective action must be taken or the law acknowledged to be a complete failure.

Beginning early in January 1944, registered letters began to go out to the growers, warning them that they were in violation of the Federal law, regardless of state permits. Some ploughed up their poppy-fields and planted something else; but others replied with form letters claiming that they had a right to produce poppy-seed. They were banding together to fight the law.

The growers now left were chiefly well-to-do men who were willing to gamble on having their poppy crop destroyed by the Government, in the hope of enormous profits in case they were able to bluff out the Narcotics Bureau, or defeat the law in a court case. They insisted on their "right" to produce a food crop regardless of narcotic dangers. What they refused to take into consideration was the fact that the reason the price of

poppy-seed remained so high was that all other farmers were obeying the law—while they proposed to profit immensely by disobeying it.

Early in March 1944, the Commissioner of Narcotics recommended that the poppy plants in several fields be destroyed by narcotic agents, as a test case. Largely because of the state permits, it was decided to act more slowly, through the Department of Justice.

In this month the Secretary of the Treasury found it necessary to say, in reply to poppy propaganda sent to the Vice-President:

"A great deal of erroneous information to the effect that the poppies grown for seed did not contain opium or morphine was deliberately circulated by persons promoting their growth".

He added:

"No step should be taken by way of permitting opium poppy production in this country, which would render our Government's traditional position inconsistent, and give aid and comfort to the enemies of effective international control of narcotic drugs".

On 22 March 1944, the Commissioner of Narcotics wrote to the known growers:

"I understand that information has been circulated that the blue poppies which have been grown in California are not opium poppies. This is incorrect. We have caused analyses to be made by both government and private chemists and have abundant proof that the blue poppies grown in California are opium poppies. If you insist on growing poppies this year, I shall be compelled to report you to the United States Department of Justice for prosecution".

At the same time the Commissioner issued instructions that an agent be sent to inspect the fields. The narcotic inspector who was sent reported, on 1 April 1944, that thirty-three fields aggregating 1,072 acres had been planted. A few to whom permits had been issued had not planted, and one grower had ploughed his plants under on about 16 March. Even after the several years of controversy, it was found that two or three farmers were growing poppies without state permits; they had applied for permits but had gone ahead without having received them. The plants at this time were only about 1 to 1½ inches high.

A narcotic agent was sent to join the inspector; the two were to keep continuous watch over the situation until it was finally settled. (The narcotic "agents" usually worked on enforcement cases, while the "inspectors" chiefly supervised the legal sales and use of narcotics.)

By the beginning of May, the growers had received their letters from the Commissioner of Narcotics and a number of them had decided to give up. On 4 May 1944, the two narcotics officers reported as follows: Poppy fields ploughed under, 10; in process of disking, 5; did not plant, 3; verbal promise to disk, 3. On 5 May, they reported that twenty-five growers had not yet ploughed under their fields, but ten of them were about to do so, leaving fifteen growers who had 725½ acres in poppies.

Analyses

The earliest analysis of the current poppy crop was made in March. A land-owning company wrote to the Commissioner reporting that a farmer leasing some of its land was growing poppies; the officials of the company inquired about their own responsibilities in such cases. The District Supervisor of Narcotics was directed to obtain samples and find out if these were opium poppies. This he did although he found that the cultivation was under state permit and the plants, at the time, were very small—approximately two inches in height and having only 2 to 4 leaves. Not much was known about the morphine content of such very small plants but it was thought to be minute, consequently the chemist asked for a sample of five pounds. He got two pounds, and to secure this amount almost an eighth of an acre was denuded of plants. He had no difficulty in proving the presence of morphine in this material.

As soon as it appeared that some cases would be fought in court, the narcotic officers began systematically gathering samples in triplicate. They were sent to three government chemists who were experienced in narcotics work; one in San Francisco, California, one in St. Paul, Minnesota, and one in Washington, D. C. At first, whole young plants were pulled up; later the green capsules were cut off. No attempt was made to make the three samples identical, but in each case three samples were taken from the same field at the same time.

COMPARISON OF SOME CHEMICAL RUSULTS

	Washington chemist		*Saint Paul chemist*	
Case No.	*Exhibit no.*	*Morphine (per cent)*	*Exhibit no.*	*Morphine (per cent)*
Young plants				
3327	5	0.051	6	0.043
3330	5	0.062	6	0.047
	8	0.058	9	0.040
3343	2	0.072	3	0.040
3344	2	0.052	3	0.040
3345	2	0.048	3	0.039
3346	2	0.056	3	0.035
3350	2	0.056	3	0.052
Capsules				
3327	13	0.18	14	0.19
	16	0.16	17	0.17
	19	0.21	20	0.20
3330	14	0.18	13	0.27
3343	8	0.17	9	0.23
3344	8	0.18	9	0.23
3345	5	0.25	6	0.19
3346	8	0.24	9	0.23
3350	8	0.17	9	0.19

There were no fundamental differences in the methods of analysis, nor in the results, though it will be noted that one set of results was consistently a little higher than the other on the young plants.

The agreement of analyses for capsules from the same field was good. Many of these capsules were quite immature and none had reached full maturity and ripeness. This probably accounts for the fact that none of them ran as high as 0.3 per cent morphine. About 0.25 per cent to 0.5 per cent would be expected of most mature capsules (on the dry basis, of course).

In examining the dried plant material it was discovered that alcohol would extract only about half the morphine. This was unexpected, as some methods of examining plant material for alkaloids call for extraction of the powdered, dried material with alcohol. It was found that alcohol could be used to take out all the morphine from fresh, green material, but in this case, of course, the moisture of the leaves was also abstracted, presumably carrying the rest of the morphine with it. A satisfactory procedure for the dried material was found to be continuous extraction with warm or hot water for a number of hours.

It was found that the capsules contained about nine-tenths of the average United States Pharmacopoeia dose of morphine per capsule. This was an understandable way of expressing the content regardless of whether the capsules were green or dried.

In several of the most important cases, the green pods, shipped by air express to Saint Paul, would still yield the milky juice when incised. Although no more than a few centigrams of opium could be collected in each case, the chemist wished to complete the proof as to the identity of these "opium poppies". The droplets of juice were collected on one of a pair of balanced weighing glasses ("watch glasses") and dried at 60 degrees centigrade. The very accurately weighed opium was then assayed by extraction methods, the separated morphine being titrated with hundredth normal acid. The morphine percentages on the dry opium in four different cases were: 10.1, 10.93, 15.66, 17.35. In the last case it was also determined that 4.77 per cent of codeine was present and 9.36 per cent of combined narcotine and papaverine, in addition to the 17.35 per cent of morphine.

Final Stages of the Campaign

In Canada, in the spring of 1944, another case of abusive use of poppy capsules was discovered and prosecuted.

In California the poppy plants grew with great rapidity during April. Early in May, the District Supervisor conferred with the District Attorney on a procedure to seize the crops.

On 10 May 1944, one of the California Congressmen asked that action be deferred, but the Commissioner of Narcotics replied, "Arrangements have been made to proceed under the law to forfeit the crops". At the same time he sent instructions to his District Supervisor to begin destroying poppies at once. On 11 May, the latter objected that the United States Attorney had proposed a different procedure.

On 12 May, the Commissioner sent an emphatic message to his District Supervisor:

"The procedure outlined by the District Attorney should have been worked out months ago and decided upon instead of waiting until this late date. We want these crops taken out of circulation, either through the District Attorney's method, or through our own efforts. . . You have the entire responsibility from now on whether to follow the District Attorney or to plow under, whichever is going to be effective. Both or either have our approval".

In the meantime the District Attorney had prepared papers for seizing the poppy crops. At the same time he sent a final registered letter to each grower:

"If steps are not taken immediately by you to plow under or otherwise destroy this crop under the supervision of the Federal Bureau of Narcotics, prosecutive steps will be instituted for the Enforcement of the Act."

The facts were given to the Press; one paper headlined "Opium Poppies Grown in Defiance of U.S. Law", another commented editorially on the "Opium Rebellion" and condemned the "recalcitrant farmers". At this time (17 May) the score stood:

Permits issued, acreage not planted, 398½;

Acreage disked, 635½;

Acreage not disked, still growing, 580½.

Most of the remaining growers would not budge, and the District Supervisor wrote asking for more explicit written instructions. On 19 May he was given explicit instructions by teletype:

"Bureau did not agree to non-prosecution of those growers who defied the law and refused to destroy poppies. You are instructed personally to arrest and file complaints against all growers who have not destroyed poppies".

The District Supervisor then went to the poppy locality—Chico and vicinity—and on 22 May personally arrested seven growers. Three of them promptly retaliated, through their attorneys, by filing a complaint against the Bureau of Narcotics, the Commissioner of Narcotics, the United States Attorney, the District Supervisor of Narcotics, and the narcotic officers who had been active, alleging that the Opium Poppy Control Act violated the Constitution of the United States. The newspaper headlines (23 May) read as follows:

"Opium Poppy Row in Court. Seven Growers Arrested, Three Seek Injunctions" (*San Francisco Examiner*)

"Poppy Growers Battle to Save $70,000 Planting. Seven Farmers are Arrested for Growing Poppies" (*The Sacramento Bee*)

Notices of seizure were posted for 575 acres of poppies. According to a short article in *Business Week*, on the "Poppy Rebellion", the pre-war price of seeds was 7 cents a pound, currently it was 75 cents retail, and the growers stood to realize a return of about $750 an acre—if they won. (Apparently the return is somewhat exaggerated: in 1942 the average yield was 510 pounds per acre, but in the best fields it went 700 to 1000 pounds.)

Some of the growers now decided to destroy their crops, but on 27 May three of them changed their minds and joined the others, in spite of the fact that they had already destroyed a considerable part of their crops.

On 31 May, the United States Attorney directed his assistant to present the cases to the Grand Jury which convened at Sacramento on 2 June 1944. Only those were to be indicted who had not ploughed up, disked in, or destroyed their poppies.

Nine growers were indicted in seven distinct cases. It was not the Government's case against them which came to trial, however, but the complaint of six of the growers and their appeal for an injunction against the government officers.

The Poppy Growers' Case

The poppy growers alleged that the Opium Poppy Control Act violated the Federal Constitution as follows:

(*a*) The Tenth Amendment, by invading the reserved right of the State of California to provide for and regulate the production, cultivation, and growing of agricultural crops within its borders, when the growing and production were conducted solely for intrastate transactions;

(*b*) The Fifth Amendment, by depriving the plaintiffs of their property without due process of law.

They also alleged that the officers were endeavouring to apply the Act in such a way as to deprive the plaintiffs of their property without just compensation, and that the enforcement of the Act did not come within the police powers of the United States so far as the growing and production of edible blue poppy-seed was concerned.

The plaintiffs asked:

"1. That it be decreed that edible blue poppies raised solely for poppy seeds are not an opium poppy, nor a plant which is the source of opium or opium products, and that the production of edible blue poppies does not come within the purport or application of the Opium Poppy Control Act of 1942;

"2. That said Opium Poppy Council Act of 1942 be declared unconstitutional . . . ;

"3. That the defendants, and each of them, be permanently enjoined and restrained from entering the real property of the plaintiffs herein and from seizing, forfeiting, and/or destroying the edible blue poppy crops now growing upon said real property. . ."

On 3 June 1944, Federal Judge Martin I. Welsh granted a temporary restraining order against the Government, to protect the crops from destruction until the case could be heard.

Although the Press generally favoured the Narcotics Bureau, the farmers who had been growing poppies or wanted to do so had considerable influence. In addition, some state officials, especially of the state Department of Agriculture and the Attorney-General's office, had, from the start, put the state in the position of favouring poppy cultivation. Under these influences the state legislature made a move which was doubtless intended to help the poppy growers in their case, though actually it could not legally affect what they had already done contrary to existing law. Headlined "Poppy Growing Approved by State Legislature", the news item of 8 June 1944 read: "An unanimous vote in the assembly today completed the adoption of a joint resolution by Senators Gordon, Crittenden, and Denel, asking Congress to enact legislation recognizing the importance of blue poppy seed for food uses and permitting its production".

Progress of the Case

Because of its urgency, it was decided that the case should be heard by a Statutory Emergency Court, consisting of two District Judges, Martin I. Welsh and Louis R. Goodman, and a Judge of the Circuit Court of Appeals, Clifton Mathews. From this Court an appeal could be taken directly to the Supreme Court of the United States. This procedure was adopted in order to get action, promptly, in regard to the existing poppy-seed crop—which was ready for the harvest—and to clear the way for a final decision on the constitutionality of the Opium Poppy Control Act.

The three-judge Court decided to make its decision primarily from briefs and affidavits, without requiring oral testimony of witnesses. In the meantime, several hearings were held before the District Judge.

On 19 June, the growers made a motion asking that they be permitted to harvest their crop. This was denied. On 7 July they filed a new motion to the same effect. At the hearing on 10 July it was shown that three of the growers had mowed some of their poppies anyway, preparatory to clearing the ground for other crops. The

poppy plants were, however, apparently just left lying in the fields at this time. The motion of the growers was again denied and they were strictly ordered not to touch any of the poppies in the field again, until the Court had made a decision.

On 27 July, the attorney for the growers suggested that the crop be harvested and sold and the proceeds impounded, and in the event the litigation resulted unfavourably to the growers that the entire proceeds be turned over to the American Red Cross. But this offer came too late and was unacceptable anyway, because, for two years past, the recalcitrants had been harvesting poppy-seeds, while those more willing to obey the law, or the wishes of the Narcotics Bureau, had destroyed their plants or given up the cultivation.

An Affidavit

Extravagant claims were made by the growers that their agricultural poppies produced only insignificant amounts of morphine in the capsules at a late stage of growth; that all poppies produce opium and morphine, including the California poppy (*Eschscholzia californica*), the state flower of California; and that innumerable other agricultural plants produce poisons in some part of the plant or at some stage of growth, so that there was no more reason to prohibit the cultivation of poppies for food purposes than of tomatoes, potatoes, lima beans, rhubarb, lettuce, tapioca, apricots, and cherries!

The analytical results of course showed plainly the amount of morphine in the poppies under attack. To further combat the claims of the growers, an affidavit was prepared by one of the government chemists, part of which will be quoted here:

"Affiant states that he is familiar with methods for the extraction and identification of morphine, and has on numerous occasions extracted morphine from *Papaver somniferum* (opium poppy) plants or parts thereof (as capsules, leaves, or petals, or seedling whole plants) and positively identified the extracted morphine.

"Affiant states that he has personally examined plants of the species *Papaver rhoeas, Papaver glaucum,* and *Papaver orientale,* species grown for their flowers in the gardens of the United States, and that no morphine whatever could be detected in the plants examined belonging to these species.

"Affiant further states that he has made a detailed examination of the scientific literature concerning poppies and the question of morphine in plants, and that there are no reliable reports of morphine being found in any species other than *Papaver somniferum;* that a few scattered reports made in the early days of alkaloidal chemistry of its occurrence in other species have been disproved by later investigators. The absence of morphine has been established by examinations made and published: for *Papaver rhoeas* (the Corn Poppy, Field Poppy, Shirley Poppies) by Hesse (1865, 1867, and 1890) and by Awe (1941); for *Papaver orientale* (the Oriental Poppy of the flower gardens) by Klee and Gadamer (1914) and by Konolova, Yunusov, and Prekhov (1935); for *Eschscholzia californica* (the California Poppy) by Reuter (1869), Danckwortt (1890), Wintgen (1898), Schmidt (1901), Fischer (1901), and Fischer and Tweeden (1902); and for *Argemone mexicana* (the Mexican Poppy) by Schmidt (1901), Schlotterbeck (1902), Bloemendahl (1906), La Prince (1909), Santos and Adkilen (1932), and Almeida Costa (1935).

"Affiant further states that poppies other than *Papaver somniferum* have a milky latex, but that since the latex in other cases does not contain morphine these other species do not contain or yield any true opium nor are their dried juices known to be used by any drug addicts.

"Affiant further states that he has personally examined the agricultural variety of *Papaver somniferum* grown for its edible seeds, and that narcotics are obtainable therefrom without chemical processing. . .

"Affiant further states that such plants as tomatoes, potatoes, lima beans, rhubarb, lettuce, tapioca, apricots, and cherries, and castor oil plants, contain no narcotics sought after by drug addicts, and that such poisons as are contained in or capable of being obtained from such plants are in no way comparable to opium, morphine, or the dried capsules of *Papaver somniferum* in their capability of abuse by reason of drug addiction."

Decision of the Court

The basic question, of course, was simply whether or not the Opium Poppy Control Act was constitutional: there was no question but that the poppy growers were violating it. There is no need to quote the brief for the "defendants"—the United States Attorney and the District Supervisor of Narcotics—as the views of the government attorneys were substantially accepted by the Court.

On 28 August 1944, the Court handed down its decision unanimously affirming the constitutionality of the Opium Poppy Control Act. The latter part of the decision will be quoted here:

"The competency of the United States to enter into treaty stipulations with foreign Powers designed to establish, through appropriate legislation, an internationally effective system of control over the production and distribution of habit-forming drugs is not questioned. The obligations of the United States incurred as a party to the two Conventions heretofore mentioned were lawfully undertaken in the proper exercise of its treaty making power. And Congress is constitutionally empowered to enact whatever legislation is necessary and proper for carrying into execution the treaty-making power of the United States . . .

"By the terms of the International Opium Convention of 1912, the United States obligated itself to control the production and distribution of raw opium. The provisions of the Opium Poppy Control Act express the determination of Congress that effective control of opium production and distribution necessitates legislation limiting the proximate source of yield of the raw opium—the opium poppy—whatever the purpose for which its cultivation is undertaken. The constitutionality of the measures thus chosen by Congress to give efficacy to the treaty stipulations of the Convention is not dependent upon the wisdom or success of the choice. Nor is it significant that the Conventions contain no stipulation expressly committing the signatory Powers to the obligations of exercising control over the cultivation of the opium poppy. The power of Congress to enact such legislation as is necessary or proper to carry into execution powers vested by the Constitution in the United States, of which the treaty-making power is one, includes the right to employ any legislative measures appropriately adapted to the effective exercise of those powers . . . So long as a rationally sound basis exists for the congressional determination that particular legislation is appropriately related to the discharge of constitutional powers, the validity of such legislation is unassailable.

"It is apparent to this Court that efficacious control over the production and distribution of raw opium can well depend upon the limitation of the cultivation of the opium poppy within the United States to legitimate medical and scientific needs only. The appropriate relationship of the means adopted by Congress to the ends thereby sought to be attained is evident. The opium poppy is the immediate source from which the raw opium is obtained; its cultivation may be undertaken without difficulty, without detection, and for illicit purposes even under the guise of legitimate pretenses; the process of extracting the raw opium from the opium poppy is a simple one; the growth of the opium poppy, wherever undertaken, can reasonably be said to afford attractiveness to those seeking a source of opium supply either for the satisfaction of their own cravings or for the profits offered by the contraband market; and this attractiveness can be expected to increase as suppression of the drug evil becomes progressively more effective and other sources of drug supply become more scarce. In view of these considerations alone, this Court is fully satisfied with the appropriate relativity of measures limiting the cultivation of the opium poppy to the objectives of the treacy stipulation to control the production and distribution of raw opium.

"We hold the Opium Poppy Control Act of 1942 constitutional."

Aftermath

It was at first thought that the poppy growers might appeal to the Supreme Court of the United States. It was obvious, however, that their chance of overturning the law would be exceedingly small, and, on 6 September 1944, the narcotics officers still observing the situation were informed by the local attorney for the Poppy Growers Association that the growers had decided not to appeal. By 16 September each of the growers had requested permission from the Court to destroy his poppies.

The destruction of the poppies was duly carried out, and the indictments against the growers were dropped. Although not finally prosecuted, their defiance of the law had brought them nothing in the end but heavy expense.

A check-up in the following year, 1945, revealed that one of the poppy growers had harvested approximately a ton of poppy-seeds from "volunteer" plants, which had sprung up from the seed scattered in 1944, although the ground had been planted to peas. The Commissioner of Narcotics wrote, "It is the Bureau's opinion that the grower should be indicted and prosecuted". This was not done but the seed was placed under seizure in September 1945. With the usual delays, it was not until 1 March 1946 that a libel of seizure was finally filed.

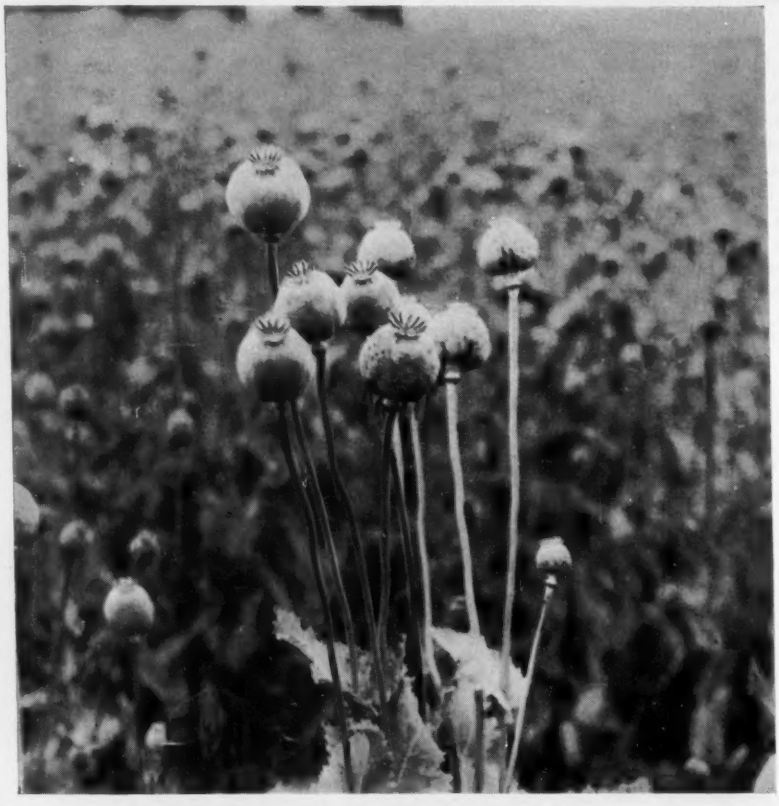
The defendant's attorney now tried to apply a method sometimes used in food and drug cases—that the government should sell the seed, deduct the costs of seizure and sale, and turn the balance of the proceeds over to the grower! After this was rejected, a default decree of destruction was finally entered, 22 January 1947. This was later modified and the seed sold for $262.50, on 18 April 1947, to a dealer in seeds. The quantity was 2,100 pounds; it analysed 84.43 per cent poppy-seed, 3.13 per cent inert matter, and 12.44 per cent weed seeds, so the dealer bid for it only 12½ cents per pound. By this time his company was purchasing pure imported poppy-seed at 17½ cents per pound, and no one had much interest in the matter any longer.

Thus, ingloriously, the "Poppy Rebellion" trailed out and finally ended.

Conclusion

Should it be necessary for the United States, in a time of crisis, to produce its own opiates, it is thought that about 600 pounds of poppy-seeds could be obtained per acre, and about 400 pounds of dried capsule chaff. At 0.5 to 0.3 per cent morphine content in the chaff, a little over some 13,000 to 22,000 acres would be needed to fill the needs of the United States for morphine, codeine, etc.,—425,000 ounces in terms of morphine. The minimum area needed, 13,000 acres, would yield about 7,800,000 pounds of poppy-seed, as compared with normal imports of 6 million to 8 million pounds. More seeds could be used for oil. The requirements of the United States for the two products of the poppy plant could therefore very well be brought into balance, on perhaps 15,000 to 20,000 acres, if domestic cultivation should ever be necessary.

The United States, however, has no present intention of entering the field of poppy cultivation. On the contrary, this field was abandoned as a matter of national policy, and commercial poppy cultivation suppressed even during the war: for it is the conviction of the narcotics authorities of the United States that only by striking at the source can the opium evil finally be overcome. It may be that in some countries the poppy can be grown for seed alone, or for seed and alkaloids, without the danger of narcotic addiction spreading among the population. Certain it is, however, that, in some countries, opium is produced far in excess of legitimate needs. It is the belief of the United States that the only way to conquer the opium evil is by restricting, and, where necessary, completely abolishing, the cultivation of the opium poppy plant itself. The narcotics authorities of the United States have expressed their satisfaction that the United States can contribute, by its own sacrifice and example, to this end.



Unripe capsules of the opium poppy plant

The Extraction of Opium Alkaloids

By André Barbier, *Chemical Engineer*

I. Classical Processes for Opium Extraction

There are three classical processes for the extraction of morphine. They are all very old: the Merck process dates from 1830; in 1835, Pelletier described a lime treatment of 5 kilograms of opium by Thiboumery, the manager of his factory. As regards the Robertson-Gregory process, the exact date of its discovery is unknown, but it was described by Wurtz in his *Dictionnaire de chimie pure et appliquée* published in 1868. Since that time nothing has been published regarding the extraction of morphine. In his book, *Die Fabrikation der Alkaloide,* published in 1927, Schwyzer merely describes the Robertson-Gregory process—with treatment of the morphine of the mother-liquors by acetylation to diacetylmorphine and saponification of the latter after purification. In their *Traité de pharmacie chimique* (vol. II, section II, 2nd edition, published in 1938), Lebeau and Courtois merely describe the Robertson-Gregory and Thiboumery processes.

The following is a description of the three old processes, followed, in each case, by a statement of their drawbacks.

Merck process. The opium is exhausted with cold water and the resultant liquor concentrated to a syrupy consistency. It is then precipitated hot with powdered sodium carbonate and heated as long as ammonia is given off; the solution should remain alkaline to phenolphthalein. After standing for twenty-four hours, the resultant precipitate is filtered and washed with cold water; when the wash water is colourless, the precipitate is dissolved in alcohol at 85°. The alcoholic solution is evaporated to dryness and the residue is exhausted by means of dilute acetic acid, which is added in small quantities as neutralization proceeds. The acetic acid solution is treated with decolorizing charcoal, then filtered and precipitated with ammonia, care being taken to avoid an excess. The precipitate is filtered, washed, and purified by crystallization from alcohol; concentration of the alcoholic mother-liquor yields a further quantity of morphine.

I have not tried this process, which is not mentioned by any modern author. The method of purifying the morphine does not appear to be a good one, and the considerable quantities of alcohol required, owing to the slight solubility of morphine in this solvent, made it impossible to consider it for industrial use.

Thiboumery and Mohr process. The opium is cut into thin slices and treated with three times its weight of hot water until a homogeneous paste is obtained. The liquid is filtered off, the residue pressed and again treated with three times its weight of water. The solutions obtained are evaporated to half their volume and poured into boiling milk of lime: one part of lime in ten parts of water should be used for four parts of opium. The precipitate is filtered off and re-treated with three parts of water to one part of opium; it is then filtered off again. The lime solutions are united and concentrated to a quantity twice the weight of the opium used. The solution is filtered, heated to boiling, and the morphine is precipitated by the addition of ammonium chloride. After cooling, it is filtered: the precipitate is washed, then purified by solution in hydrochloric acid and crystallization of the morphine hydrochloride.

This process is an attractive one: there are no technical difficulties and the morphine is well separated from the secondary alkaloids: the morphine solutions are relatively clean. I made certain changes in this process; for instance, instead of precipitating the lime solution with ammonium chloride, I acidified it slightly with hydrochloric acid and salted out the morphine hydrochloride with common salt. In this way I obtained almost all the morphine from the lime solution in the form of very pure hydrochloride. The morphine remaining in the salted-out liquid was precipitated and returned for purification.

I found, however, that this process had one important drawback: the yield was definitely bad. I subsequently discovered that I had not been the only one to encounter this difficulty. It is possible that the bad yield is due to an oxidation of the morphine in alkaline solution, but the fact that the lime always retains morphine was also a contributory factor.

Robertson-Gregory process. The opium is completely exhausted by five to ten times its weight of cold water; the solution obtained is evaporated to the consistency of a soft extract, and then the process is repeated with cold distilled water. This aqueous re-extraction causes impurities to precipitate, they are filtered off and the solution obtained is evaporated until its density is 10° Baumé. One hundred and twenty grammes of calcium chloride for each kilogram of opium are added to the boiling liquor which is then diluted with a quantity of cold water equal to its own volume. A precipitate of meconate and sulphate of calcium is thus formed and is filtered off. After filtering, the liquid is again concentrated, and this produces a new deposit which consists almost exclusively of calcium meconate. This deposit is filtered off and the solution is left standing. After a few days it becomes a crystalline mass composed of morphine hydrochloride and codeine hydrochloride: this is known as "Gregory's salt". The crystals obtained are drained and then placed in a cloth and squeezed out in the press. They are purified by successive crystallizations, the solutions being decolorized each time with animal charcoal. When the crystals are sufficiently pure, they are dissolved in water and the morphine is precipitated with ammonia; the codeine remains in solution.

The first drawback of this process is that 20 to 25 per cent of the morphine is left with the secondary alkaloids in the brown and viscous mother-liquids after filtration of "Gregory's salt". Schwyzer separates and purifies this morphine by precipitating all the alkaloids, by dissolving the secondary alkaloids in acetone, by acetylating the impure morphine in order to purify it in the form of diacetylmorphine, and then by saponifying the latter to re-convert it to morphine. This process is complicated and cannot be as good as the author claims, owing to the solubility of morphine in acetone which, although slight, is not negligible.

The second drawback is that the hydrochloride of morphine and codeine crystallize in furry needles which retain the mother-liquids in which the crystallization occurred. Several successive crystallizations and subsequent recoveries are required for purification, and this is a time-consuming process.

Schwyzer purifies the mixture of hydrochlorides by malaxation with a small quantity of ice-water and subsequent pressing; he repeats the process several times. This no doubt enables him to leave less morphine in the mother-liquids, but that fact does not make the process much more attractive.

II. Study of a New Process

Having observed the drawbacks of the various known processes, I thought that it should be possible to evolve a new process, more suitable for industrial use, on the scale which I had in mind. I considered that the first phase of this process was the extraction of opium with water, the concentration of the aqueous extract and the precipitation of all the alkaloids, which is the first part of the Merck process. It seemed to me that it should then be possible to separate the morphine, which is practically insoluble in certain organic solvents, from the secondary alkaloids which are soluble. In this way I hoped to obtain all of the morphine, obviously in a very impure form, but nevertheless completely separated from the other alkaloids. The tests which I made enabled me to arrive at the anticipated result by using benzene. I considered that I had already gained a definite advantage over the Gregory process, but one problem remained: the purification of the morphine obtained. There is no known solvent which allows of the easy crystallization of this base, and the only solution was to use a salt as intermediary and purify the latter. When using hydrochloric acid I encountered the same difficulties in purification as those I have already mentioned; I had to find a morphine salt of small solubility in water and of crystalline form such that the mother-liquor could be easily eliminated. As no salt with these properties had been described, I tried preparing organic salts of morphine, and found that morphine tartrate was the ideal salt for purifying this alkaloid. The use of this salt successfully completed the first part of my work and enabled me to find an opium treatment fully suitable for industry.

I should mention, however, that during my bibliographical research two years ago, I found that Tanner (C. 1905.I, p. 525) had obtained a precipitate of morphine acid tartrate in preparing the neutral salt. This author indicates a solubility of one part of morphine acid tartrate in 100 parts of water. I found that 100 parts of cold water dissolved 1.5 parts of morphine acid tartrate; this means that this salt is only a third as soluble as the hydrochloride. It has the advantage of crystallizing from very impure solutions in large crystals, which can be filtered off and washed with the greatest ease. It is possible, by using morphine acid tartrate, to obtain morphine from residues which contain only 4 per cent. The purification of morphine by passage through this salt had never previously been described; but it is simpler and less costly than any of the usual processes.

The yields obtained by my process were 95 per cent of the morphine in the opium used (applying the Harrison method of assay).

The League of Nations established specific rules for the sampling of opium, and the sellers mix it in order to provide lots of which all pieces have the same morphine content. Nothing of that kind existed in 1921: the morphine content varied from one cake to another, and the cakes were of all sizes. Sampling was carried out, at the factory, by a representative of the seller and a representative of the purchaser. It was

very difficult to obtain an average sample of the lot, as the seller tended to take copious samples from the cakes the appearance of which revealed a high morphine content, while the purchaser did the opposite. Thus, in one lot having the same morphine content, half of which was purchased by us and the other half by a competitor, the sampling showed 12 per cent of morphine in one case and 13 per cent in the other.

Lastly, the various methods of assay gave different results: the Codex, Harrison, and the Dr. Gilbert methods did not show the same morphine content, and the price of opium assayed by the Harrison method was not the same as the price of the same opium assayed by the Dr. Gilbert method.

The international method of assay now used gives almost the same results as the Harrison method.

It is my experience that when assaying opium for morphine by a lime process, it is essential, first, to carry out the trituration of the opium with water with the greatest care until a very fine and homogeneous paste is obtained. Only then can the lime be added, as otherwise it will produce a precipitate of very hard meconate of lime around the particles of opium not reduced to thin paste. This will prevent the morphine covered over by the meconate of lime from dissolving, and thus it will not be included in the assay.

III. Industrial Application of the Process

On the basis of 300 kilograms of opium per operation

The process consists in:

A. Extraction of the opium;
B. Concentration of the liquids;
C. Precipitation of the total alkaloids;
D. Extraction of the secondary alkaloids;
E. Preparation of morphine acid tartrate;
F. Precipitation of the morphine base;
G. Treatment of the secondary alkaloids;
H. Extraction of the alkaline liquids;
I. Natural codeine.

A. Extraction of the Opium

As the aqueous extract of opium must be concentrated before further treatment, methodical extractions should be carried out so that not too much water will have to be evaporated.

Five parts of water are used to one part of opium: the opium is cut into thin slices and placed in the extractor which contains the water for extraction. In order to avoid blocking, the stirrer is set in motion as soon as any opium is placed in the extractor. The water is heated to 45 degrees for the first extraction in order to facilitate the disintegration of the opium; this heating is unnecessary when opium marc is being extracted.

The extractions are made as follows:

First extraction:	Fresh opium	Extracted with the liquid from a previous second extraction
Second extraction:	Marc of first extraction	Extracted with the liquid from a third extraction
Third extraction:	Marc of second extraction	Extracted with the liquid from a previous fourth extraction
Fourth extraction:	Marc of third extraction	Extracted with pure water
	Marc of fourth extraction	Thrown away after making certain that it does not contain any morphine

The aqueous extracts are always acid to litmus and the marc of the fourth extraction hardly ever contains any morphine. In 1930, however, we had to treat opium, saved from the fire at Smyrna, which contained 10.5 per cent of morphine. This opium, which had been subjected to a fairly high temperature, had lost part of its volatile acids and the morphine was in a form insoluble in water (probably that of the base), but soluble in lime, and this enabled it to be detected by the assay. This particular opium was treated with disastrous results during a period when I happened to be absent for several months. Those in charge at the factory did not heed the warnings given by the accountant who had noted that the entries for morphine yield were abnormally low: they failed to check the acidity of the extraction liquids or to make the indispensable examinations of the extracted marcs. They burned these marcs in the boiler with the morphine which they still contained. When I returned and took stock I found that 125 kilograms of morphine base had disappeared in this way. The lesson to be drawn from this incident is that, even when manufacture is carried out with perfect regularity, the chemical engineer should never relax his vigilance, and that the results obtained in the analytical laboratory are more important than any hypothesis. There was 10.5 per cent of morphine in the opium treated, and that morphine should have been extracted or else an attempt should have been made to find the missing morphine. The assertion that, despite the assay, the failure to extract further morphine was due to the fact that the opium did not contain any more was a fanciful hypothesis which was not justified by the fact that the process had been strictly followed.

I subsequently added to the last extraction, a quantity of pure concentrated sulphuric acid, in the proportion of one cubic centimetre of acid per kilogram of opium; this addition of acid permits of a more complete extraction of bases—narcotine and papaverine, certain quantities of which always remain in the marc.

The apparatus consists of four 3,000 litre extraction vats with stirrers, the whole being made of lead-coated iron. Each extractor has two decanting pipes with bronze cocks, at levels which enable 750 and 500 litres respectively to be left in the vat. In the lower part there is a bronze drop-valve 100 millimetres in diameter, which allows the thick sludge, consisting of the marc and the water remaining after the several decantations, to be drained off. There is one 2,500 litre cylindrical vacuum receiving tank for each extractor, that is, four receiving tanks in all.

At first I installed vacuum filters with a filtration surface of 5 square metres, but the results were not satisfactory. Owing to the fragments of capsules which it contains, Turkish opium gives extracts which can be filtered, although with difficulty. It is almost impossible to filter opiums from other sources. In any event, the period of filtration varies considerably and does not allow the work to proceed regularly.

After making tests with a decanter with clay filter and suction apparatus, I replaced the filters by centrifugal decanters 1.50 metres in diameter with 8-h.p. motors operating directly on the shaft. Two decanters are required, each of them being placed between the two extractors which it serves.

The liquid is first decanted by means of the upper cock; if it is clear, it is drawn directly into the receiving tank; otherwise the decanter is set revolving and the decanted liquid is transferred to the receiving tank by means of the suction apparatus. The liquid flowing through the second decantation cock is then passed into the centrifugal apparatus, the stirrer is set in motion and the marc is centrifuged three times.

The densities of the solutions are as follows:

From the first extraction, 1.030 to 1.035;
From the second extraction, 1.012 to 1.014;
From the third extraction, 1.006 to 1.007;
From the fourth extraction, 1.002 to 1.003.

B. Concentration of the Opium Liquids

The opium liquids resulting from a first extraction, which amount to some 1,600 litres, must be concentrated and reduced to 300 litres. The apparatus used has a capacity of 3,000 litres; it is made of lead-coated iron and a coil, also lead-coated, is used to heat the liquid. A copper still could also be used; when making a laboratory test I also used an aluminum apparatus which served the purpose well.

The concentration is made by means of a vacuum; the condensation of the distilled water is effected by means of a nest of copper tubes. The condensed liquids are collected in two receiving tanks which are used alternately; the distillation is a delicate matter, particularly at the start, as the opium liquids froth a great deal. Before being thrown into the drain, the condensed liquids are examined in order to make certain that they do not contain morphine, which might be the case if the froth was carried over. Generally speaking, only at the start does the distillation present difficulties, thereafter there is no need for constant supervision of the apparatus. This would not be the case if one wished to use a small apparatus with continuous feed.

C. Precipitation of the Total Alkaloids

When the opium liquids are reduced to one litre per kilogram of opium, their volume is 300 litres. They are placed in a 1,000 litre apparatus made of lead-coated iron and equipped with a lead-coated stirrer and a double jacket of sheet iron which permits of steam-heating and water-cooling. The liquids are heated to 85°-90° and precipitated at that temperature by powdered Solvay-process sodium carbonate. When alkalinity to phenolphthalein is reached, no further Solvay powder is added; ammonia is given off. After heating for one hour, the alkalinity to phenolphthalein is again tested and, if it has disappeared, more Solvay powder is added. When persistent alkalinity is achieved, the mixture is cooled; there is a precipitate of small grains which are filtered off and washed. They are then dried without heat in order to remove as much of the water as possible, as the total alkaloids are not dried in the oven before the treatment is continued.

D. Extraction of the Secondary Alkaloids

As we have seen, the secondary alkaloids are separated from the morphine by means of a solvent. I gave the preference to benzene, but other hydro-carbons and chlorinated derivatives such as carbon tetrachloride, trichloroethylene, etc., may also be used.

The apparatus consists of a 600 litre extractor without stirrer, which is joined at the top to a condenser and at the bottom is equipped with a drain-cock leading to a 400 litre distilling apparatus. There is a perforated plate covered with filter cloth a few centimetres from the bottom of the extractor. On this cloth is placed a tubular crown of perforated steel having a vertical branch which goes out through a tube in the cover and can be connected to the steam. The total alkaloids are then placed in the extractor, benzene is added to cover them, the lid is put on and the mixture is left to soak. After half an hour the lower cock is opened and the benzene containing the secondary alkaloids is allowed to flow into the distilling apparatus. The extraction is repeated with fresh benzene until a sample of 10 cubic centimetres of benzenic solution leaves, after evaporation, a residue of less than 0.1 gr. The cover is then put on and steam is directed through the perforated crown so as to carry off the benzene retained by the raw morphine remaining on the filter cloth.

The benzenic solution which contains the secondary alkaloids—narcotine, papaverine, thebaine, and codeine—is distilled after each extraction; this makes it possible to use a smaller still and benzene receiving tank. A thermometer dips into the liquid, and distillation is stopped when the temperature begins to rise. After the benzene has been distilled from the last extraction, the mixture is allowed to cool gradually and 20 litres of water are added. It is then re-heated in order to expel the remaining benzene. The residue, which is in the form of a thick tar, is run off hot into a vat; it will be treated subsequently in order to separate the secondary alkaloids.

E. Preparation of Morphine Acid Tartrate

At the time of my first tests, I wished to convert raw morphine into acid tartrate in aqueous solution, to purify it with charcoal, and to filter and crystallize it. Two difficulties arose: the solution of acid tartrate crystallized in the pipes during vacuum filtration, despite the fact that the filter and the intermediate receiving tank were heated; and the solution, which was transferred to a vat cooled by a *herse* and having a stirrer, produced an insulating crust of morphine acid tartrate on the vat lining and this prevented cooling. I had already met with this difficulty in the crystallization of other products and knew that there was no simple remedy. I therefore decided to make all the treatments on the neutral salt and to make the acid salt by adding tartaric acid to the cooled solution of the neutral salt; this gives a real precipitation of morphine acid tartrate in fairly fine crystals from which the mother-liquor can be easily removed by filtration and washing.

The raw morphine separated from the minor alkaloids is placed, with 600 litres of water, in a 1000 litre enamelled cast-iron vat, with a wooden stirrer and water bath for heating: the mixture is heated to 80°C. and tartaric acid is gradually added until there is slight persistent acidity to methyl red. In order to facilitate the filtration and to decolorize the solution, charcoal from the treatment of the acid tartrate is added to precipitate the base morphine (see F. Precipitation of the base morphine).

The acid solution is vacuum filtered on an enamelled cast-iron filter with a wooden filter plate and a double steam-jacket to keep the solution hot. A vacuum is created in an enamelled cast-iron evaporator with a cover and a double steam-jacket; this evaporator, which is linked up with the filter, receives the solution of morphine neutral tartrate. The tubes are made of lead. After the charcoal and the insoluble matter have been carefully washed with hot water on the filter, the filtered solution is discharged into an enamelled cast-iron vat with a wooden stirrer and double jacket for cooling. When the solution is in the vat, the stirrer is set in motion, and the solution is cooled by passing water into the double jacket. When the solution is cold, the same quantity of tartaric acid as had been used to make the neutral tartrate is added, plus an excess of about 1 kilogram. The solution must be acid to methyl orange; otherwise, a further quantity of tartaric acid must be added.

After being stirred for about another two hours, the mixture is left standing for one night and then the morphine acid tartrate is filtered on an enamelled filter 80 centimetres in diameter with a wooden filter plate. When the liquid is cold, a stone jar (in which a vacuum can be created), with a pipe at the bottom, will be used as a receiver. This jar should be washed periodically, as in the course of time a small quantity of morphine bitartrate is deposited there.

The filtered product is washed on the filter with cold water and dried as far as possible. The mother-liquor is concentrated in enamelled vats with a wooden stirrer and double jacket for heating and cooling. After two further precipitates of morphine bitartrate have been obtained, there remains mother-liquor which, contrary to all expectations, contains a small quantity of codeine. The treatment of this mother-liquor will be described later: I would, however, point out at this stage that, whilst it is stored, this liquid releases a further small quantity of morphine acid tartrate, which should, of course, be put aside for extraction of the morphine.

F. Precipitation of the Base Morphine

The moist acid tartrates of the first, second, and third precipitates are combined and placed in an enamelled vat provided with a lower pipe with a built-in ceramic cock and a wooden stirrer. Water four times its weight is added to the acid tartrate and the mixture is heated by passing live steam through a movable lead pipe. When the temperature reaches 85 degrees, the lead pipe is removed and the stirrer set in motion. To ensure smooth working and to avoid crystallization of the acid tartrate during treatment, a return to the neutral tartrate is made by adding ammonia to the solution, which should, however, remain slightly acid to methyl red. Decoloration is effected by using charcoal (5 to 10 per cent of the weight of the moist tartrate). I noted that the decoloration was improved by adding 300 gr. of sodium acetate "snow", 200 gr. of ammonium oxalate, and 100 gr. of sodium bisulfite per operation. The decoloration of the solution is observed by filtering a sample and precipitating the morphine content with ammonia. This should give a white morphine; if the precipitate is not satisfactory, a further quantity of charcoal and a little bisulfite are added; if a solution of ammonium oxalate gives a further precipitate, ammonium oxalate should also be added.

When the solution of morphine tartrate, treated as above, gives a white morphine upon precipitation with ammonia, the morphine is run onto an enamelled cast-

iron filter with a wooden filter plate and is collected in an enamelled cast-iron intermediate receiving tank in which a vacuum is created. The charcoal is washed on the filter and used again when the raw morphine is dissolved with tartaric acid (see E. Preparation of morphine acid tartrate).

The filtered solution is run into an enamelled cast-iron vat having a wooden stirrer, and the morphine is precipitated hot with ammonia (at approximately 60°). The solution should be barely alkaline to phenolphthalein and an excess of ammonia should be avoided. The solution is left to cool for one night and after the alkalinity to phenolphthalein has again been verified, the base is vacuum-filtered on an enamelled cast-iron filter. It is washed with water, and the mother-liquors are preserved for subsequent extraction with butyl alcohol (see H. Extraction of the alkaline liquors).

The morphine obtained is dried on trays in a drying oven at 80°; it is hydrated and contains approximately 2 per cent of impurities. It can be used for the manufacture of codeine, dionine, or heroin.

It is better to prepare a purer morphine for the manufacture of morphine hydrochloride; for that reason, the solution of morphine tartrate decolorized with charcoal is not precipitated with ammonia after filtration. It is run into an enamelled vat and, after cooling, pure hydrochloric acid is added to restore the acidity to methyl orange. This gives ammonium chloride and a precipitate of morphine acid tartrate. This tartrate is filtered and washed; it is treated in the same way as the tartrates of the first, second, and third precipitations in order to precipitate pure morphine. The acid mother-liquors are precipitated with ammonia in order to extract the morphine remaining in solution in the form of acid tartrate; the morphine recovered in this way is filtered and returned for purification by tartaric acid; the alkaline liquids are extracted with butyl alcohol.

G. The Secondary Alkaloids and their Treatment

The secondary alkaloids, with the exception of codeine, were formerly of little interest; I extracted them nevertheless but did not trouble about the yield. Subsequently, papaverine as such, and thebaine owing to its derivatives, became very important.

In the process which I have described, the secondary alkaloids pass into the benzene when the total alkaloids are treated with this solvent. There is, however, a certain quantity of codeine in the alkaline precipitation liquids of the total alkaloids, and these liquids also contain a certain quantity of thebaine. Moreover, a certain quantity of codeine does not dissolve in the benzene, although the volume of benzene used should be capable of dissolving several times the weight of the codeine contained in the opium. Hence, some codeine remains with the raw morphine, and this codeine is finally left in the mother-liquors of the morphine tartrate process in the form of acid tartrate.

I have always disregarded the narceine in opium, as it can be produced from the narcotine, large quantities of which are unused.

I separated the secondary alkaloids by using the difference in basicity between thebaine and codeine, which are strong bases, and narcotine and papaverine, which are weak bases.

The secondary alkaloids extracted from the benzenic solution take the form of a more or less hard tar; this tar is placed in an enamelled vat with a wooden stirrer and a double sheet-metal jacket used for heating and cooling. Three parts of water to one part of secondary alkaloids are placed in the vat and heated to 80°, the mixture being stirred; the product melts and tartaric acid is gradually added until neutrality to methyl red is achieved. The solution with tartaric acid takes a very long time, as the thick and viscous mass mixes badly with water; during the treatment a certain quantity of water evaporates and is replaced in order to preserve a constant level in the vat. When the solution remains neutral, it is cooled; the narcotine-papaverine mixture solidifies into more or less coarse grains. It is filtered and washed with a little water; the solution containing the codeine and thebaine is concentrated until a sample gives an abundant precipitation of thebaine acid tartrate upon addition of tartaric acid. When this degree of concentration is reached, tartaric acid is added to the solution to obtain acidity to methyl orange, and the solution is cooled. The thebaine acid tartrate is filtered and washed; it is purified by crystallization from water. The thebaine base is obtained from pure tartrate by precipitation with ammonia or a filtered solution of sodium carbonate. The precipitation of a hot solution of thebaine tartrate in a mixture consisting of equal parts of water and ethyl alcohol enables thebaine to be obtained in crystalline form.

The mother-liquors of thebaine tartrate contain codeine; their treatment will be described in the special chapter on codeine.

After filtering off the tartaric solution, the narcotine-papaverine mixture is placed moist into an iron cohobator equipped with a stirrer; three parts of methylethylketone and 0.10 part of decolorizing charcoal are added for each part of the alkaloid mixture and the whole is cohobated and stirred. After dissolving, the mixture is passed, under pressure, through a filter and the filtrate is collected in a cast-iron vat cooled by a *herse* and equipped with an iron stirrer. The narcotine crystallizes; it is filtered and washed. It is purified by recrystallization in the methylethylketone, in the presence of charcoal.

The papaverine is contained in the mother-liquors of methylethylketone; papaverine acid oxalate is precipitated by adding oxalic acid until acidity to methyl orange is reached. The papaverine acid oxalate is purified by several crystallizations in water; the pure oxalate is redissolved in water and precipitated with ammonia in order to obtain pure base papaverine.

H. Extraction of the Alkaline Liquids

Despite the low solubility of morphine in water, it is essential to extract all the alkaline liquids obtained during manufacture. This is all the more essential as, owing to the impurities which they contain, the residual liquids dissolve a quantity of morphine appreciably in excess of the quantity soluble in pure water. I have extracted 0.75 gr. of morphine per litre from the alkaline precipitation liquids of morphine.

Morphine is not very soluble in most immiscible organic solvents; moreover, the alkaline liquids to be extracted readily give emulsions with the solvents. For my purposes, the most suitable solvents seemed to be butyl alcohol and amyl alcohol. I chose butyl alcohol.

As the quantities of water to be extracted were considerable, I made continuous extraction tests in the laboratory. These gave good results and I applied this method in the workshop.

The alkaline liquids deposit a sludge during storage; this is separated by filtration or by centrifuging, and as it contains morphine (approximately 7 per cent), it is again treated with tartaric acid by the method described above.

The apparatus for extraction consists of two 500 litre receiving tanks with an outlet pipe at the bottom. One is used for the liquids to be extracted, and the other for the butyl alcohol. These receiving tanks are connected with a small constant-level receiving tank which enables a regular outlet speed to be maintained. The hourly quantities of liquids to be extracted and of butyl alcohol are regulated by means of interchangeable pipes with calibrated orifices. The extraction is carried out in a column 25 centimetres in diameter and 2 metres in height filled with Raschig rings and with a coil for steam-heating in the lower half. The lower part of the column is fixed on a flat cylinder 40 centimetres in diameter and 20 centimetres in height, and the upper part carries a cylinder 40 centimetres in diameter and 40 centimetres in height. The extraction takes place at a temperature of 60 degrees C; the butylic alcohol arrives through a pipe at the bottom of the column, and the mother-liquors through a pipe at the top of the column; the force of gravity causes the liquids to descend whilst the alcohol rises. The fresh butyl alcohol is in contact, at the bottom of the column, with liquids which contain practically no more morphine and, as it rises, meets liquids which are increasingly rich in morphine. The butyl alcohol containing alkaloids flows out through a pipe at the top of the upper cylinder resting on the column; the aqueous liquids flow out through a pipe at the bottom of the cylinder at the base of the column and re-ascend through a vertical tube the outlet of which will be some 25 centimetres lower down than the outlet pipe for the butylic alcohol.

The liquids extracted contain butyl alcohol in solution and they must therefore be heated to 100° in order to distil and recover it. This part of the process might be made continuous, but I carried it on intermittently.

On the other hand, the butyl alcohol containing alkaloids is treated continuously. It comes into a 120 litre distilling apparatus with a powerful coil for steam-heating. The mixture of water and butyl alcohol boils at 96° although the boiling point of butyl alcohol alone is 116°. The butyl alcohol from the extraction contains 10 per cent of water and distilling is therefore carried on continuously and in the presence of water. A decanter separates the water, which returns into the still, from the butyl alcohol which passes back again for extraction. If the boiling temperature rises, a further 10 litres of water should be placed in the distilling apparatus.

Every two or three days the contents should be fully distilled and the apparatus drained. The tar obtained is treated with tartaric acid by the method described for the treatment of raw morphine.

I attribute the good results of continuous extraction by means of the column described above to the fact that the butyl alcohol dissolves 10 per cent of water, and that water also dissolves 10 per cent of the butyl alcohol. This facilitates contact between the solvent and the solution to be extracted. I attempted to make continuous extractions with the same apparatus by using the benzene as a solvent, but without success. I attribute this failure to the insolubility of benzene in water; this decreases the contact between the solvent and the solution to be extracted. Apparatus with powerful stirrers should be used for extractions with solvents which are not miscible with water.

I. Natural Codeine

In the process described, codeine is contained:

(1) In the mother-liquors of thebaine tartrate;

(2) In the mother-liquors of morphine acid tartrate produced by the treatment of raw morphine and by the treatment of the tar obtained from extraction with butyl alcohol.

Liquids of different origin should not be mixed but the treatment is always the same. A 400 litre sheet-metal apparatus with a powerful stirrer is filled with the liquids up to the level of the decantation pipe

which is placed at the 240 litre level; flakes of caustic soda are added until alkalinity to phenolphthalein is reached, and the extraction is made with benzene. After the mixture has been allowed to stand, the benzenic solution is run through a Florentine decanter into a distilling apparatus. The extractions are continued until a sample of benzene no longer contains codeine. The benzene is distilled after each extraction, but not fully, and when extraction is complete, the benzene is distilled without going over 85°; the remaining mixture is left to cool off slightly, 10 litres of water are added and the mixture is heated to 100° in order to expel all the benzene. The raw codeine which is in the form of an oil is run off. It is purified by means of the hydrochloride.

After extraction with benzene, the alkaline liquids are run into a vat and iron-free hydrochloric acid is added until acidity to methyl red is reached. The slightly acid solution is heated and precipitated with powdered Solvay's process sodium carbonate until it is alkaline to phenolphthalein. After cooling, the precipitate which contains a little morphine is filtered off; the liquids are extracted with butyl alcohol. The impure morphine filtered off is treated with tartaric acid by the ordinary method.

Chemical and Physiological Identification of Indian Hemp

BY P. DUQUÉNOIS, *Professor at the Faculty of Strasbourg, expert accredited to the courts of lau*

The identification of Indian hemp (*Cannabis sativa* L. var. *indica*) or of any product containing active hemp resin (charas, hashish, kif, marihuana, etc.) no longer offers any difficulty today. The purpose of the present article is to indicate the surest methods of *chemical and physiological characterization* used at present in France. Several of these methods are of recent date and are not yet well known to experts.

Cannabinol, which was isolated as an impure oil by Wood and his collaborators (1896) and subsequently by Fraenkel, Czerkis and, later, Casparis, was finally obtained in the pure state by Cahn[1] and reproduced in 1940 by the two independent syntheses of Ghosh, Todd and Wilkinson[2] and of Adams, Baker and Wearn.[3] This solid (melting point: 163 degrees-164 degrees C.), which corresponds to the formula 6"-hydroxy-2-2-5'-trimethyl-4"-n-amyl-dibenzopyran, and which was formerly considered to be responsible for the physiological activity, is accompanied by related derivatives, namely the tetrahydrocannabinols—the real intoxicating agents—and cannabidiol, which is physiologically inactive. In recent years it has been found possible to obtain these substances from Indian hemp resin.

Chemical Identification

(1) Phenolic Functional Group

All the dibenzopyranic substances we have just mentioned—cannabinol, tetrahydrocannabinol and cannabidiol—are capable of being acetylated and yield p-nitrobenzoates. They all possess at least one phenolic functional group.

It is not surprising, therefore, that Indian hemp extracts, which contain these phenolic substances, should exhibit various analytical reactions of the phenols or polyphenols. These reactions may be carried out on the residue obtained by taking the extract produced by the exhaustive extraction of Indian hemp with petroleum ether and evaporating off the solvent in a water-bath.

(a) Ferric cation reaction

The residue from the extract is redissolved in 1 cubic centimetre of 95 per cent alcohol, and one or two drops of 1/10 Fe Cl_3 solution are added to the alcoholic solution. A greyish-green coloration is produced.

This indicative reaction is of course in no way specific: many phenols give an analogous green colour (pyrocatechol, homopyrocatechol, pyrocatechoic aldehyde, caffeic acid, carvacrol and certain tannins give it, but many of these substances cannot be extracted with petroleum ether).

(b) Millon's reagent

The petroleum ether extract gives a red coloration verging on orange with this reagent. Tyrosine, protides containing this amino-acid and many phenols give this coloration.

(c) Vanillin-phosphoric-acid reagent

A few crystals of vanillin and then ten drops of officinal H_3PO_4 are added, in the evaporating dish, to the residue from the petroleum ether extract. A pink coloration is produced which disappears with the addition of alcohol. We have also obtained a pink coloration with phenol and hexylresorcinol. Resorcinol, indole and piperine give red colorations and alpha-naphthol and tryptophane give a violet coloration under the same conditions.

(2) Reduction Reactions

The extracted resin is more or less of a reducing agent, depending on the commercial varieties, the origin and the age of the sample. Reduction reactions, which are usually not pronounced, are not distinctive: neither Fehling's solution nor Nessler's reagent (in the cold)

are reduced, but with the latter a purplish coloration is formed round the sides of the dish (see Beam's reaction below). Unlike morphine, the extracted resin does not reduce iodic acid.

Silver ammonio-nitrate solution is sometimes reduced by extracts prepared from fresh samples. Cannabinol and the tetrahydrocannabinols are weak reducing agents, while cannabidiol must be responsible for the reduction observed with Tollens' reagent.

(3) Special Colour Reactions

These are the reactions used by the toxicologists and chemists employed in the technical police.

(a) The so-called Beam's reaction

This reaction was in reality discovered by Fraenkel and has been incorporated in the French Pharmacopœia.

A few drops of a 5 per cent alcoholic solution of caustic potash are added to the petroleum ether extract. A stable violet-purple coloration is produced, which turns to blue on the addition of water.

We have reported the few substances which also give this reaction (alkyl dioxyquinones, juglone, embelin). Without being absolutely specific, this reaction is very useful, owing to its simplicity.

The reaction is not always dependable. R. Weitz and Dardanne[4] were the first to show that it can be absent with officinal preparations obtained by means of hot alcohol. Using old samples (more than twenty years old) which are, however, still active for cold-blooded animals, we have not always succeeded in reproducing this reaction.[5] It is now known that Beam's reaction is characteristic not of a tetrahydrocannabinol but of cannabidiol, which is physiologically inactive.

J. Bouquet[6] has modified Beam's classical alkaline test.

(b) Beam's acid reaction

Another of Beam's reactions is carried out in an acid medium. A few cubic centimetres of absolute alcohol saturated with gaseous HCl, when added to the extraction residue, gives a cherry-red colour which disappears on the addition of water. The reaction is not very practical in use. The following more convenient modification has been proposed by Mrs. Remziye Hissar[7]:

The residue from the petroleum ether extract is dissolved in 1-2 cubic centimetres of $CHCl_3$, which is poured into a test-tube. One cubic centimetre of pure H_2SO_4 is added with a pipette, shaking well. After a few moments a layer of acid settles beneath the chloroform showing a mahogany coloration which slowly deepens during the next twenty-four hours.

Pinene, terpene, terpineol, guaiac, incense, gum benzoin, jalap, sage, rosemary, lavender and tobacco give more or less similar red colorations.

(c) Ghamrawy's reaction

One cubic centimetre of a reagent composed of: p-dimethylaminobenzaldehyde, 1 gr.; concentrated sulphuric acid, 5 cc.; distilled water, 1 cc.—is allowed to act on the petroleum ether extract. After a minute on the water-bath there appears a reddish-brown colour, which turns to purplish-red on cooling. On the addition of a few drops of water, a blue or indigo coloration appears and persists after dilution.

The specificity is fairly good. Similar colorations are obtained with some resins or essences (phenolic, terpenic), but these are not absolutely identical with the successive colorations that appear in the case of hashish.

The sensitivity is very high. Even 1/2 milligram of resin is detected. Old samples generally show this reaction better than Beam's reaction.

(d) The reaction of P. Duquénois and H. Negm (acetaldehyde-vanillin)

Two cubic centimetres of the reagent: vanillin, 0.40; acetaldehyde, 0.06 (6 drops); 95 per cent alcohol, 20 cubic centimetres, are poured onto the petroleum ether extract (preferably still warm) in an evaporating dish.

The mixture is stirred, and when solution is complete 2 cubic centimetres of concentrated HCl are added. A circular movement is imparted to the dish and a succession of colors appears: sea-green, slate, followed by indigo within 10 minutes. Within half an hour the color turns to violet and within an hour to intense violet.

This reaction is specific if one considers the succession of tints. Phloroglucinol gives a violet coloration in the end, but starts with red, not green. Moreover, phloroglucinol is insoluble in petroleum ether.

Sensitivity: down to 1/2 milligram of resin.

Dependability: equal to that of Ghamrawy's reaction and therefore better than that of Beam's reaction.

Permits of a colorimetric determination of the amount of resin[8, 9].

(e) Perhydrol-sulphuric-acid reaction

With H. Negm,[9] we have reported another reaction. The residue from the petroleum ether extract, when acted on by 2-3 drops of 100-volume hydrogen peroxide and then by 10 drops of concentrated sulphuric acid, gives an intense blood-red coloration.

The sensitivity is also of the order of 1/2 milligram.

The test is not specific. Aspirin, diaminophenol and brucine also give a bright red coloration, turning yellow in the case of brucine. Phenacetin turns brownish-red.

Like the following reaction, it does not occur with old samples, the physiological action of which is weakened.

Physiological Characterization

The United States Pharmacopœia mentions the inebriating and convulsant action of Indian hemp on dogs. The method is somewhat insensitive since large doses are required to obtain marked symptoms. Using white mice weighing between 15 and 20 grammes each, Mrs. Remziye Hissar[7] had to use approximately 5 milligrams of resin to obtain definite recognizable effects. Miss Jeanne Levy has shown that rabbits, which are exceptionally tolerant, are poor test animals.

We prefer the use of the poikilothermals which provide a more sensitive method of identifying the drug.

(*a*) *Tadpoles of the red frog* (*Rana fusca*)

The tadpole of the *Rana fusca* is more sensitive than the adult frog and can be used to demonstrate the strong toxic action of the resin. But this animal, which has the additional disadvantage of being seasonal, does not permit of clear differentiation between the resin and other poisons. A phase of excitation (whirling movements) quickly appears (after a few minutes) followed by a depressive phase with small contractions and spontaneous convulsions (with strychnine, the convulsions are induced rather than spontaneous) and then a fatal asphyxic phase with vasoconstriction and discoloration of the head, the median part of the body retaining its pigmentation.

If the tadpoles are placed in fresh water before death occurs, no sequelae are observed (paralysis with strychnine).

(*b*) *Minnows* (*Phoxinus laevis*)

Using minnows in ordinary water to which an aqueous maceration of Indian hemp had been added, H. Negm,[10] of our laboratory, observed a phase of excitation (sudden movement, rapid swimming, circular movements, respiratory difficulty, convulsive fits) followed by a depressive period (motor sluggishness, slow breathing, which becomes panting and loss of balance); the minnow falls to the bottom of the aquarium, lies on its side and dies after a time which is proportional to the concentration of poison. We have carried out experiments on gold fish, *Carassius auratus,* weighing 1.5 grammes and placed in 80 cubic centimetres of water with resin added, which show that, with 1 milligram of resin, loss of balance begins to appear in 20 minutes followed by strong convulsions in 40 minutes and death after 1 hour 40 minutes on an average.

(*c*) *Smooth-tailed stickleback* (*Gasterosteus Leiurus*)

One use of the Portier and Lopez-Lomba method on this species shows that the stickleback is the ideal animal for the investigation of the toxic potency of Indian hemp. For details of the method used and the results obtained, we refer the reader to our paper published in 1939.[11] The small weight of the fish used as reagent, and its sensitivity which will show the presence of 0.3 to 0.4 milligram of resin extracted by petrolium ether, permit of the confirmation of the chemical analysis. Nevertheless, the biological method lacks the specificity of the chemical reaction using acetaldehyde-vanillin. The effects are similar to those we have observed with other convulsant poisons (e.g., narcotine) in considerably larger doses.

Loss of balance begins to appear after approximately 10 minutes with 1 milligram in 80 cubic centimetres of water, after approximately 25 minutes with 0.5 milligram and after approximately 30 minutes with 0.3 milligram.

Strong spontaneous convulsions which throw the stickleback out of the water appear after approximately 11 minutes with 1 milligram and after 30 to 45 minutes with 0.5 milligram in 80 cubic centimetres of water.

Rotatory movements about the longitudinal axis of the body begin after 20 minutes with a dose of 1 milligram in 80 cubic centimetres. With a dose of 0.3 milligram, the subject turns about its axis with no sense of orientation or balance after 75 minutes.

The speed with which the symptoms appear therefore depends on the dose of the active substance. The order of their appearance is fairly constant.

(*d*) *Earthworms and other helminths*

In a chemical paper prepared in 1938 in collaboration with H. Negm[9] we showed that all the colour reactions obtained with Indian hemp resin are akin to those obtained with santolactone, terpenic essences (chenopodium, thyme, eucalyptus), rotenone and embelin, phloroglucinol, the derivatives of which constitute the filicic group, and hexyl resorcinol, all of which are anthelminthic substances. Indian hemp seeds were used for their vermifugal properties by the ancient Chinese, and H. Negm[10] has studied this action for the first time on the earthworm, using the Sollmann method.

Earthworms in a solution of resin wriggle, twist and show excitation which subsequently diminishes. The animal extrudes earth through the anal segment after which the contractions cease in that portion. Paralysis gradually extends to the lower two thirds of the body. Only the head continues to move. Finally, the animal dies, the segments being relaxed and flaccid and the clitellum swollen.

The oily extract is much more active than the aqueous extract. The anthelminthic action can also be observed with *Ascaris lombricoides.*

Conclusions

Indian hemp, the most dreaded social poison of modern times in America and in some countries of the Near East, can be identified by numerous methods.

Of the chemical methods, the Ghamrawy reaction and the acetaldehyde-vanillin reaction we proposed in 1937 in collaboration with H. Negm, are the best. The latter method, capable of colorimetric application, was adopted by the League of Nations Sub-Committee on Cannabis in 1939.

The presence of active resin can be confirmed without difficulty by experiments on small fishes, particularly sticklebacks.

All the colour reactions discovered before the constituents of *Cannabis sativa* L. var. *indica* were known, can now be explained. They are for the most part due to cannabidiol, a derivative of resorcinol. In relatively fresh drugs, cannabidiol always predominates in the resin. However, it may disappear in galenic treatment or during prolonged storage, while the tetrahydrocannabinols derived from it may still be present and make the preparations active.

Certain special reactions, common to terpenic substances, show the structural relationship of cannabinol, cannabidiol and the tetrahydrocannabinols to paracymene and methyl-4-isopropylbenzene, which can be deduced from their formulas.

The intensity of the colour reactions is in many cases related to the activity of the drug on poikilothermals and probably also in homeothermals but it will be readily understood that the relationship is not always proportional: the inactive cannabidiol, which in many cases determines the results of the chemical tests, is no more than the precursor of the highly active tetrahydrocannabinols in the drug.

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Fifth Session of the Commission on Narcotic Drugs

The fifth session of the Commission on Narcotic Drugs will be of particular interest in view of the importance of its agenda.

As at its previous sessions, the Commission will devote part of the session to the consideration of matters referred to it under the international conventions and protocols on narcotic drugs. One of these matters will be the study of the annual reports forwarded by the Governments on the control of narcotic drugs in their territories. The suppression of the illicit traffic will also be the subject of discussions in the Commission, which will have before it a series of bi-monthly summaries prepared by the Secretariat reproducing the substance of the reports on this matter forwarded by the Governments. Trends in the illicit traffic and the geographical movement of it will be closely studied by the Commission. The laws and regulations relating to narcotic drugs, communicated by the various countries, the Secretariat's progress report on the work of the Division of Narcotic Drugs, the reports of the Permanent Central Board and the Supervisory Body, and the progress made in the Far East in the suppression of opium smoking, will form other items on the agenda.

While it is not intended to list all the items which will be placed on the agenda by the Secretary-General *ex officio* and those which may be proposed for inclusion by the Governments, it should be stressed that the Commission's discussions will centre on three main questions.

The first is the preparation of a new single convention on narcotic drugs in order to achieve the following objectives:

To unite in a single legal instrument the established regulations and the provisions of the eight international instruments now in force; to simplify the existing system of international control, which would comprise only two bodies instead of three, and only one secretariat; to extend and strengthen international control (plants cultivated under international control and intended solely for medical use, complete prohibition of the use of certain drugs, centralization of control); to adapt the control to economic, social and legal developments; to facilitate the adjustment of such control in the future and to make it more flexible by simplifying the methods and rules and thus effect savings in time and expenditure by closer co-ordination.

The second question is the report of the Commission appointed by the Economic and Social Council to inquire, on the spot, into the effects of chewing the coca leaf and the possibility of limiting its production and distribution. The Commission's terms of reference and membership were given in the *Bulletin on Narcotics* for October 1949 (see pages 22-23 and 41).

After spending three months in Peru and Bolivia the Commission returned at the beginning of December to Lake Success where it began at once to draft its report, which will be submitted through the Commission on Narcotic Drugs to the Economic and Social Council during its session. The report is now being printed and will be published in July 1950.

It should be noted that new legislation relating to the coca leaf was recently introduced in Argentina, Bolivia and Peru and is reproduced in this issue of the *Bulletin*.

The third question which deserves mention in these columns is the report of the *Ad Hoc* Committee of the principal opium-producing countries.

On several occasions the League of Nations attempted to solve the complex problem of effective limitation of opium production, but its work was interrupted by the war. In the new circumstances the United Nations decided, in view of the new factors which have altered the problem in detail, to tackle the problem by stages, the first and most important stage being to secure the accession of the principal opium-producing countries to the necessary agreements for the limitation of production. It was for this purpose that the Economic and Social Council approved a proposal by its Commission

on Narcotic Drugs for a meeting of the *Ad Hoc* Committee of the principal opium-producing countries, which met at Ankara from 21 November to 7 December 1949, as arranged, the Governments of India, Iran, Turkey and Yugoslavia being represented.

The Committee was confronted by very considerable difficulties, which are inherent in any attempt to reach an agreement of this kind, and first elaborated in some detail the proposed structure for an interim agreement under which the Governments would have been enabled to put into effect their intention of limiting the production of raw opium to medical and scientific requirements.

The *Ad Hoc* Committee decided unanimously that such limitation should be based on estimates of the Governments' opium requirements to be furnished annually by them to a co-ordinating authority. It proposed further that at national level the interim agreement should be given effect through Government opium monopolies which would be operated on a generally uniform pattern in all producing countries of which the Governments had become parties to the interim agreement.

The concept of the Government monopoly would be applied to the international plane by the creation of an international purchasing and selling agency. The Committee considered this innovation in the field of international relations to be an essential part of the final solution of the allied problems of opium-drug addiction and the illicit traffic in opium and opium drugs, since it would render valuable assistance in eliminating the considerable over-production which up to the present has fed that trade and made possible the clandestine manufacture of drugs. The agency, which would be established as a non-profit-making, self-supporting corporation, would be under the obligation to buy each year from the opium monopolies of Governments parties to the interim agreement their total production of opium over and above any required for use within the country in question. Such opium monopolies would be entitled to sell only to the agency, which would itself assume the reciprocal obligation of limiting its purchases of opium from the monopolies. Similarly, the agency would have a monopoly in the trade to countries desirous of importing opium for the manufacture of drugs or for other medical or scientific purposes.

Finally, the Committee envisaged the establishment of a co-ordinating authority which would take the executive decisions required to ensure the smooth application of the agreement, the drawing up of the estimates of opium requirements and the notification of the proportion of production allocated, and which might prescribe sanctions in any case of continued over-production of raw opium.

The Committee did not overlook the fact that, logically, the draft agreement should be submitted for consideration to a joint meeting of representatives of the principal drug-manufacturing countries and of representatives of the principal opium-producing countries before being submitted for approval to the Economic and Social Council.

At a meeting held on 29 May 1950 the Interim Committee on Programme of Meetings (Economic and Social Council) considered the steps to be taken to give effect to the proposal of the *Ad Hoc* Committee and a proposal of the Government of France that the joint meeting should be preceded by a meeting of representatives of the principal drug-manufacturing countries.

While the Committee agreed that, in general, the Commission on Narcotic Drugs should meet annually, it recognized that adequate time should be given to the members of the Commission to study results which might be expected from the preliminary meetings held in connexion with the proposed Interim Opium Agreement before the fifth session of the Commission, and that technical considerations would render it difficult for that session to be held before the end of 1950.

The Committee decided to recommend the following resolution for adoption by the Economic and Social Council:

"The Economic and Social Council

"Decides

"To invite

(*a*) The Governments of the principal opium-producing countries (viz. India, Iran, Turkey, the Union of Soviet Socialist Republics and Yugoslavia) and of the principal drug-manufacturing countries having membership in the Commission on Narcotic Drugs (viz. France, Netherlands, United Kingdom, the Union of Soviet Socialist Republics and the United States of America) to send representatives to meet as a Joint Committee at Geneva on 14 August 1950, and

(*b*) The Governments of the other States members of the Commission on Narcotic Drugs and of the other principal drug-manufacturing countries (viz. Belgium, Italy and Switzerland) to send observers to the meetings of that Committee.

"To invite the Governments of the principal drug-manufacturing countries (viz. Belgium, France, Italy, the Netherlands, Switzerland, the United Kingdom, the Union of Soviet Socialist Republics and the United States of America) to be represented in the same

manner as in the Joint Committee referred to in the preceding paragraph, at a special session to be convened for 7 August.

"To postpone, as an exceptional measure, the opening of the fifth session of the Commission on Narcotic Drugs to 8 January 1951, and to convene this session at the headquarters of the United Nations.

"To hold the sixth session of the Commission on Narcotic Drugs during August-September 1951."

Finally, at its eleventh session, on 10 July 1950, the Economic and Social Council decided that the fifth session of the Commission on Narcotic Drugs would be held at the headquarters of the United Nations from 30 November to 16 December 1950.

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SCIENTIFIC PUBLICATIONS ON NARCOTIC DRUGS FOR 1949

INTRODUCTION

The following bibliography has been prepared by the Secretariat and includes scientific publications on narcotic drugs which appeared during 1949, as well as a few which appeared in 1948 but could not, for technical reasons, be included in our list for that year published in the *Bulletin on Narcotics,* vol. II, no. 1.

This bibliography has no claim to be complete, and information regarding books or articles not included in this bibliography would be gratefully received by the Division of Narcotic Drugs, Department of Social Affairs, United Nations Secretariat.

The bibliography has again been arranged by subject in the following fashion:

Part I. General and reference works;

Part II. Opium poppy, opium and drugs manufactured therefrom

- A. Opium poppy, opium, and prepared opium
- B. Morphine
- C. Other drugs manufactured from the opium poppy;

Part III. The coca leaf and drugs manufactured therefrom;

Part IV. Cannabis and cannabinol drugs;

Part V. The synthetic drugs;

- A. General works
- B. Demerol-dolantine-pethidine-isonipecaine-meperidine
- C. Amidone-methadone-dolophine-"10820"
- D. Other synthetic drugs;

Part VI. Addiction to narcotic drugs;

Part VII. Miscellaneous works.

Under each heading, publications are arranged alphabetically by author. Due to the nature of the sources available to the Secretariat for preparing this bibliography, several of the titles are given in translation only. They are preceded by an asterisk.

Part I

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